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Wetland Trends and Policies in North Carolina and South Carolina

Duke University
Durham, NC

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to the
Office of Technology Assessment

WETLAND TRENDS AND POLICIES
IN
NORTH CAROLINA AND SOUTH CAROLINA

August 1982

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WETLAND TRENDS AND POLICIES
IN
NORTH CAROLINA AND SOUTH CAROLINA

by
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Master's project submitted in partial fulfillment of
the requirements for the Master of Environmental Management degree in the
School of Forestry and Environmental Studies
of Duke University
1983

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ABSTRACT

Within the last ten years, no comprehensive wetland inventory has been completed for either North Carolina or South Carolina. The most complete inventories include Circular 39 (1956) for both states, Wilson's 1962 inventory of 41 coastal plain counties of North Carolina, and Tiner's 1977 study of non-forested tidal marsh in eight coastal counties.

In North Carolina and South Carolina, no estimate of trends in wetland loss is available for all wetland types on a statewide basis. In 1978, 65 acres of wetlands were altered in North Carolina and 138 acres were altered in South Carolina, due to permitted dredge and fill activity. In North Carolina, 22.2% of the marshland in the coastal counties had been "altered" and 7.1% had been "destroyed" between 1956 and 1968. Thirty-three percent of pocosin land has been totally converted since 1962. There was a 10.9% increase in bottomland hardwood acreage from 1964 to 1974. The strongest pressures causing wetland destruction in North Carolina are agriculture, which has drained 12.8% of the wetlands, and forestry, which has drained 19% of the state's wetlands. In South Carolina, 19% of the tidal marsh acreage was lost from 1936 to 1977, bottomland hardwood acreages have increased slightly, and 95% of the Carolina Bays have been altered--mostly for agricultural or forestry purposes. Forestry, agriculture, and urbanization are the major factors causing wetland loss in South Carolina.

Section 404 of the Clean Water Act is the most effective federal tool in both states for regulating wetland development within the Corps of Engineers' jurisdiction. One study by the National Marine Fisheries Service (NMFS) estimated that 404 and 10/404 permits for 1978 preserved 365 acres of North Carolina wetlands and 1086 acres of South Carolina wetlands. Studies done in 1980 and 1981 by NMFS showed 83% and 100% respectively of those granted 404 permits in North Carolina complied with their permits. The same study done in South Carolina for 1980 and 1981 showed 60% and 66% respectively of those applicants granted 404 permits complied with permit conditions.

In North Carolina, the Coastal Area Management Act (CAMA) is the most important state law regulating wetlands. In South Carolina, the Coastal Council regulates coastal waters and saltwater wetlands, while the Water Resources Commission regulates development in all other navigable waters.

Several wetland types are unprotected in both states, including many Carolina bays, bogs, pocosins, and bottomland hardwoods. Isolated wetlands are unprotected in both states because they are not joined to any stream or river system, are not considered to be an AEC or a Critical Area, or are below mean high water.

Case studies of Hilton Head Island, Prulean Farms and the Albemarle-Pamlico Peninsula illustrate the manner in which wetland regulations have influenced planning and development. The Land Resource Information Service (LRIS) is discussed as a mapping system which could be used in planning.

Breakdown of Work

This project was completed jointly by Carin Chitterling, Charlotte Clark Heather Nixon, and John Lohnes. The former three are submitting this paper in fulfillment of the Master's Project requirement.

Each student was responsible for researching a particular area of the study. Charlotte Clark studied both the effectiveness of federal and state programs in controlling the development of wetlands and the implications of potential changes in federal programs on wetland losses and development activities in North Carolina. John Lohnes studied the same features of the corresponding South Carolina programs. Carin Chitterling researched the trends in wetland development and use and the technological and physical factors which have affected these trends in North Carolina. Heather Nixon conducted a parallel study of the wetlands in South Carolina. These sections were researched and written separately, and then integrated to form a comprehensive paper which was submitted to the Office of Technology Assessment, Washington, D.C., in fulfillment of a grant contract. Successful integration required much team effort , and it was necessary for each person to contribute to all parts of this paper, including participation in joint interviews, research and editing.

"Our aim has been to place the merits
of these lands in their true light;
not to exaggerate or depreciate.
If this aim has been secured
we shall be satisfied with the results."

Ebenezer Emmons, 1860
The Swamp Lands of North Carolina

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EXECUTIVE SUMMARY

Wetland Trends and Policies in North Carolina and South Carolina

The purpose of this study is to examine and assess the effectiveness of legislation on wetland preservation and loss in North Carolina and South Carolina.

Inventory data

* Within the last ten years, no comprehensive wetland inventory has been completed for either North Carolina or South Carolina.

* Circular 39 is the only study which has calculated acreages of wetlands in both North Carolina and South Carolina. This study, published in 1956, is somewhat out of date. It estimated that 4,054,000 acres of wetlands existed in North Carolina and 3,337,000 acres existed in South Carolina.

* Wilson's 1962 inventory, the most recent study covering all wetland types, estimated that 4,000,890 acres of wetlands existed 41 coastal plain counties of North Carolina.

* A 1977 South Carolina study by Tiner estimates that there were 504,445 acres of non-forested tidal marsh in eight coastal counties.

Trend data

* In North Carolina and South Carolina, no estimate of trends in wetland loss is available for all wetland types on a statewide basis.

* National Marine Fisheries Service 1978 data, summarizing the amount of dredge and fill activity proposed and actually permitted, show that 65 acres of wetlands were altered in North Carolina and 138 acres were altered in South Carolina.

* For North Carolina, Burdick (1967) estimates that 22.2% of the marshland in the coastal counties had been "altered" from 1956 to 1967. Spinner (1968) calculates that 7.1% of marsh in these counties had been "destroyed" from 1956 to 1968. Richardson (1981) determined that 33% of pocosin land has been totally converted since 1962. In 1974, the Forest Service estimated that the total bottomland hardwood acreage was 2,691,989 acres, a 10.9% increase from 1964.

* The strongest pressures causing wetland destruction in North Carolina are agriculture and forestry. Doucette and Phillips (1978) estimated 12.8% (230,000 acres) of the wetlands in North Carolina had been extensively or partially drained for agriculture, and 19% (337,000 acres) of the wetlands had been partially drained for forestry.

* In South Carolina, 19% of the tidal marsh acreage was lost from 1936 to 1977. Bottomland hardwood acreages have increased slightly.

- It has been estimated that 95% of the Carolina Bays in South Carolina have been altered--mostly for agricultural or forestry purposes (Sharitz and Gibbons, 1981).

- Forestry, agriculture, and urbanization are the major factors causing wetland loss in South Carolina.

Wetland policy

- Section 404 of the Clean Water Act is the most effective federal tool in both states for regulating wetland development within the Corps of Engineers' jurisdiction. One study by the National Marine Fisheries Service (NMFS) estimated that 404 and 10/404 permits for 1978 preserved 365 acres of North Carolina wetlands and 1086 acres of South Carolina wetlands.

- Pre-application meetings between individuals and state and federal representatives significantly decrease the wetland acreage altered by a project. Such meetings speed up the permit process and increase the percent of permits issued.

- The Wilmington District Corps of Engineers has been consistently cooperative with federal review agencies. In the Charleston District, joint on-site visits and conferences have been infrequent in the past, though this has begun to change in recent years. Joint enforcement conferences involving all federal and state personnel in the 404 process are particularly useful in providing an open forum to discuss controversial permits and difficult violations and to resolve conflicts.

- Almost half of the permits issued annually by the Corps of Engineers in North Carolina and South Carolina involve 404 (either Section 404 or Section 10/404 permits). The Wilmington District Corps issues permits for 90-97% of the applications involving 404 that it processes annually; it denies 3-5% of those applications. The District modifies 95% of issued permits. The Charleston District Corps issues 92%-95%, and denies 6%-10% of the permits involving 404 that it processes annually. The Charleston District Corps modifies 30% of issued permits.

- The Wilmington District Corps sends 2%-26% of the violations it investigates to the U.S. Attorney for litigation, while the South Carolina Corps litigates from 2%-14% of its violations annually.

- The Wilmington Corps usually negotiates settlements for violations through restoration and a fine determined from the violator's past permit record and the degree to which successful restoration is possible. The South Carolina Corps generally requires restoration only. The courts in both states have usually been reluctant to impose fines where restoration is required.

- The Wilmington District Corps: (1) has reduced delays in permit processing through a general permit for all activities permitted by the

State Office of Coastal Management, (2) issues joint public notice with the state for permits involving wetlands, (3) conducts joint on-site visits with state and federal agency personnel for all non-routine projects, (4) shares aerial photography with the state Office of Coastal Management, (5) conducts joint enforcement meetings on a regular basis, and (6) works closely with the U.S. Attorney's Office. The Charleston District Corps: (1) issues joint public notice with the state, (2) shares aerial photography with the state Coastal Council, (3) conducts joint on-site visits with state and federal agency personnel for a few few non-routine projects, and (4) plans to begin joint enforcement meetings on a regular basis in the near future.

- The two Corps districts implement their Section 404 regulatory program in different ways. The Wilmington District addresses the need to regulate wetlands in a broader manner and works very closely with review agencies at all stages of the permitting process. The Charleston District has adopted a stricter interpretation of 404 legislation and relies less heavily on federal review agency comments. Basic differences in staff organization preclude complete consistency in decisions made by the two districts.

- In North Carolina, the Coastal Area Management Act (CAMA) is the most important state law regulating wetlands. Some coastal landowners feel the value of their land has been decreased due to CAMA regulations. A 1980 study, however, showed that the Act had not restricted the ability of landowners to use their land and therefore had not decreased its value (Liner, 1980).

- The North Carolina Coastal Resources Commission innovated a unique joint application form covering CAMA permits, state dredge and fill permits, state 401 water quality certifications, permits for an easement to fill state-owned lands, and COE 404 permits. If, after reviewing this application, the Office of Coastal Management issues a permit, the case qualifies for a COE general permit. This measure coordinates agencies, decreases state and federal policy overlap, and streamlines the permit process.

- In South Carolina, the Coastal Council regulates coastal waters and saltwater wetlands, while the Water Resources Commission regulates development in all other navigable waters. The Coastal Council has been very effective in preventing wetland loss from routine development, but tends to be subject to local political pressures in cases involving large industrial or commercial projects. The effectiveness of the Water Resources Commission in managing wetlands has been minimal due to limited jurisdiction and a small regulatory staff.

- A 1978 study by the Urban Institute showed that 54% of those parties who were granted CAMA permits complied with all conditions on their permits. Studies done in 1980 and 1981 by NMFS showed 83% and 100% respectively of those granted 404 permits in North Carolina complied with their permits. The same study done in South Carolina for 1980 and 1981 showed 60% and 66% respectively of those applicants granted 404 permits complied with permit conditions.

- Joint application forms and general permits relieve the federal and state regulatory burden. In South Carolina direct regulatory overlap occurs between Corps and state agencies in tidal salt marshes and in lands below mean high water. Although some people criticize the overlap for creating an unnecessary burden on applicants, others note that it provides a good system of checks and balances.

- State coastal management staffs were cautious in expressing interest in assumption of the 404 process. Partial federal funding and less strict federal oversight would make state assumption of the 404 program more attractive.

- Several wetland types are unprotected in both states, including many Carolina bays, bogs, pocosins, and bottomland hardwoods. Isolated wetlands are unprotected in both states because they are not joined to any stream or river system, are not considered as an AEC or Critical Area, or are below mean high water.

Case Studies

- The Special Area Management Plan for Hilton Head Island, written by the South Carolina Coastal Council (SCCC), has been a useful tool in the protection of certain specified wetlands on the island. Developers have been aided in planning projects on the island because the Special Area Management Plan describes SCCC policy with regard to development in wetland area. Several wetlands are currently being studied for secondary wastewater discharge treatment on the Island.

- Prulean Farms Joint Venture, a large agricultural development proposed for Dare County, North Carolina, illustrates some of the problems faced by the private sector with respect to wetland regulations. Promoters of the project have been frustrated by delays and uncertainties in the Section 404 permitting process. They feel there is a need to define in greater detail the goals of the 404 program and the resource to which it applies.

- The Albemarle-Pamlico Peninsula in North Carolina, an area primarily made up of pocosin wetlands, is currently under heavy development pressures from Prulean Farms, First Colony Farms and Weyerhaueser timber company as well as mining industries. Atlas project, an ongoing environmental mapping project at Eastern Carolina University, will provide a means of quantifying these pressures.

- The Land Resources Information Service (LRIS), is a computer mapping system which provides a precise and accessible data base for geographic information. Wetland mapping on such a system would allow loss trends to be calculated and compared with information such as population density or soil types. Policy decisions concerning wetlands could benefit from this type of data base, since it would provide up-to-date data on total wetland development for the entire state by county.

Data needs

- Compilation of information from National Wetland Inventory maps for both North Carolina and South Carolina is needed. Funding is currently being sought from interested state and federal agencies to do such compilation. Information such as overall state wetland acreage estimates, and acreage by wetland type in each state will result.

* Wetland acreage loss permitted by state and federal regulatory agencies needs to be calculated. This is possible through compilation of wetland acreage loss figures contained in files for each project receiving a Section 404 or a state coastal permit. This would provide an accurate assessment of the effect of the regulatory programs in the states.

I. Introduction

The wetlands of North Carolina and South Carolina are among the most diverse and extensive in the United States, including coastal marshes, pocosins, Carolina Bays, bottomland hardwoods, cypress swamps, and mountain bogs. Perhaps due to this diversity, past efforts to locate and characterize the states' wetlands have been both sporadic and limited in scope. No current comprehensive surveys exist for either state.

Today, a new understanding of the values of natural wetlands for flood control, wildlife habitat, water filtration, water storage, and recreation has led to policies and legislation aimed at controlling development of these lands (Greeson et al., 1978, Richardson, 1981). Yet these efforts, too, have been piecemeal and may be inadequate in light of current development trends. There is a need to determine the extent and nature of wetlands in North Carolina and South Carolina, and to evaluate the effectiveness of the various programs designed to protect and manage this valuable natural resource. The exodus of industry from the North to the Southeast, increasing pressure from development interests, and a conservative political climate in both states emphasize this need.

Dissatisfaction with the current laws attempting to regulate wetland development is widespread. The industrial sector and some federal and state agencies chafe under extensive rules, guidelines, and permits, while other agencies and conservation groups press for stricter regulations and management guidelines. Section 404 of the Clean Water Act works in the midst of this controversy, ostensibly protecting the nation's waters from discharge of dredged and fill material, but in actuality serving also as the primary federal tool for regulating wetland development.

This report summarizes wetland acreages and discusses the factors causing wetland losses in North Carolina and South Carolina. An evaluation of the effectiveness of Section 404 and other federal and state programs in controlling wetland loss in the two states is also presented along with agency comments on recommendations to improve wetland programs.

II. Inventory of Wetland Acreages

A. Nationwide Studies

Numerous attempts have been made to inventory the wetlands of the United States from those studies done in the late nineteenth century to the current U.S. Fish and Wildlife Service's National Wetlands Inventory (Cowardin, 1979). Initial attempts followed the Federal Swampland Acts of 1849, 1850, and 1860 which ceded to the states "all lands unfit for cultivation due to flooding" (Gosselink and Baumann, 1980). These surveys, however, were completed very rapidly and in many cases the new landowners were required to inventory their own swamplands. The accuracy of these surveys, therefore, has been questioned (Gosselink and Baumann, 1980).

In 1889, Shaler conducted a survey of the freshwater wetlands of the United States using a classification system which defined swamps more strictly than had previous studies. However, a preface to his estimates of the swampland acreages states that "the object of preparing this table is rather to indicate the importance of these winnable lands to the agricultural interests of the country than to afford precise statistics to the area of interest" (Shaler, 1889). Therefore, Shaler's estimates of swampland, which range from 2,240,000 to 2,560,000 acres in North Carolina and from 1,600,000 to 1,920,000 acres in South Carolina, may not be relied upon as a precise information base.

Other national inventories during the early twentieth century were conducted for reasons such as the determination of "conservation needs" (North Carolina Conservation Needs Committee, 1971) or the determination of "land mostly too rough, or too poor for crops, or requiring drainage" (Gray et al., 1924). Such inventories are not directly applicable to estimating total wetland acreages. Additional inventories that derive partial wetland acreage cannot be used as a data base because of incomplete data or the use of differing classification systems (Gosselink and Baumann, 1980).

The most complete information that can be found for wetland acreages on the national level is the U.S. Fish and Wildlife Service's Circular 39 (Shaw and Fredine, 1956). This publication estimates a total of 4,054,000 acres for all wetland types in North Carolina and 3,377,000 acres for South Carolina. Circular 39 has been widely used as a data base for wetland studies. A full update of this inventory is currently being made through the National Wetlands Inventory (Cowardin, 1979), which will cover all wetland types on a nationwide basis. Although progress in the future may be hampered by lack of funding, the entire coastal area of North Carolina and South Carolina has been aerially photographed with a 1:80,000 resolution for infrared photographs and 1:60,000 for black and white photographs. Maps of wetlands will be made from these photographs and will be available in three sizes: 1:250,000; 1:100,000; and a quad sheet overlay of 1:24,000. Although the inventory will delineate fish and wildlife habitat, it will not be of the detail needed for the regulatory purposes of some agencies (Gould, pers. comm., 1982). The National Wetlands Inventory will, however, provide regulatory personnel with some useful acreage data (Wright, pers. comm., 1982).

B. North Carolina Studies

Similar problems to those in the national inventories, such as differences in definition and scope, exist at the state level. Studies describing North Carolina wetlands are not comprehensive. They cover only a specific area of the state or a specific wetland type. In 1867 and 1833, efforts were made by North Carolina's Literary Board, later the Board of Education, to inventory the approximately 1,500,000 acres of swamplands which they owned. Due to "hasty and insufficient examination," (Kerr, 1883) these reports are considered inaccurate. In 1909, Pratt attempted a swampland inventory for twenty-eight counties in North Carolina. However, the definition used -- swamplands that "are susceptible of drainage and subsequent cultivation" (Pratt, 1909) -- does not specify a geologic or biologic definition and therefore this precludes the use of the information as a data base.

In the most complete inventory of wetlands in North Carolina, Wilson (1962) found a total of 4,000,890 acres of wetlands in 1962 for the forty-one coastal plain counties. It is estimated that 95% of the state's wetlands are located in that region (Wilson, 1962). A summary of Wilson's findings is given in Table 1.

Table 1: Total acreages of wetlands by type[1] in 41 Coastal Plain Counties in North Carolina (Wilson, 1962).

WETLAND TYPE	ACREAGE IN NORTH CAROLINA
Bottomlands (Type I)	428,650
Inland Open Fresh Water (Type V)	104,590
Wooded Swamps (Type VII)	1,015,200
Bogs (Type VIII)	2,243,300
Shallow Fresh Marsh (Type XII)	47,500
Swamp	2,800
Irregularly Flooded Salt Marsh (Type XVII)	100,450
Regularly Flooded Salt Marsh (Type XVIII)	58,400
Total	4,000,890

[1] Type refers to classification used in Shaw and Fredine (1956). See Appendix A for a listing of these wetlands by Type.

Wilson's survey used Circular 39's classification system and was designed to locate land "suitable for waterfowl" (Wilson, 1962). Field investigations were conducted over the two-year period between August 1957 and July 1959, and aerial photography was used to plot all wetlands greater than 40 acres on county base maps. Only small wetlands would have been overlooked using such a scale; such areas are not a significant percentage of the state's wetlands. This study, like that of Circular 39, has been used extensively as a data base for studies of wetland loss in North Carolina. Information updated since Wilson's study is available from various sources for pocosins, bottomland hardwoods, shallow fresh marsh, regularly and irregularly flooded salt marsh, and deep swamps. The update of estimates is summarized in Table 2. Additional studies are needed, however, to provide accurate 1982 acreage estimates of these wetland types.

Table 2: Current Information for Acreages of North Carolina Wetlands.

TYPE	ACREAGE	AUTHOR	Publication Date
Natural Pocosins (I)[1]	602,134	Richardson	1982
Bottomland Hardwood (I & VII)	2,691,989	USDA Forest Service	1974
Shallow Fresh Marsh (XII)	47,016	Burdick	1967
Salt Marsh (XVII, XVIII)	113,558	Burdick	1967
Deep Swamps	450,255	USDA Forest Service	1974

[1] approximate types according to Circular 39

C. South Carolina Studies

A large percentage of South Carolina's wetlands are found in its coastal counties: Horry, Georgetown, Charleston, Berkeley, Dorchester, Colleton, Beaufort and Jasper. For these counties, the inventory completed by Tiner (1977) is used extensively by state and federal agencies involved in wetland development and protection in South Carolina. This inventory provides acreage figures for saltwater and freshwater coastal marshes by county (Table 3). A total of 504,445 acres of these wetlands are found in the coastal counties of South Carolina. Information for this inventory was collected from aerial photography and ground surveys. The acreage figures provided are considered accurate to within ± 5.0% (Tiner, 1977).

The only other statewide study for South Carolina estimates the area of bottomland hardwoods. This estimate was made as part of a South Carolina forest inventory conducted by the U.S. Department of Agriculture (USDA) Forest Service Southeastern Forest Experiment Station in 1977. Some 2,268,000 acres of these bottomland hardwoods exist in South Carolina (Knight and McClure, 1979).

Several smaller scale studies of wetlands in South Carolina have been conducted during the past decade but cover only subregions within the state.

Table 3: Acreages for Marsh Types and Impoundments for Coastal Counties of South Carolina (Tiner, 1977).

COUNTY	TOTAL SALTMARSH	BRACKISH MARSH	FRESH MARSH	IMPOUNDMENTS	TOTAL
Horry	1,849	312	727	75	2,963
Georgetown	12,278	8,262	23,764	11,940	56,244
Charleston	131,558	10,843	5,000	22,999	170,400
Berkeley	5,974	1,278	17,511	4,294	25,057
Dorchester	0	439	862	45	1,346
Colleton	20,471	10,170	8,608	20,596	59,845
Beaufort	128,658	1,357	1,523	4,278	135,816
Jasper	33,713	2,301	6,536	6,224	48,774
Total	334,501	34,962	64,531	70,451	504,445

For example, the *Santee River Basin Water and Land Resources Study* (USDA, 1973) shows 131,500 acres of marshland in the Santee basin, 18,000 of which are freshwater tidal marsh. The *Yadkin-Pee Dee River Basin Study* estimates a total area of 590,503 acres of wetlands in the South Carolina portion of this basin (Dunn, pers. comm., 1982). These numbers were determined by using a planimeter on a 1979 map prepared from Landsat imagery. Riverine swamp acreages in South Carolina were determined by Don Hill of the Corps of Engineers, Charleston District, from the map of wetlands in the *Environmental Reconnaissance Inventory of the State of South Carolina* (U.S. Army Corps of Engineers, 1973), using a planimeter. He estimated that 2,949,316 acres of this riverine swampland exist in the state, excluding the Savannah River basin area. The riverine swamps consist of wooded and shrub swamps and seasonally flooded bottomlands. A summary of current information for wetlands in South Carolina is found in Table 4.

III. Trends in Wetland Use

A. North Carolina

The lack of comprehensive studies over the past century precludes an accurate determination of trends in total wetland use in North Carolina. It is possible, however, to discuss trends for three wetland types: pocosins, marshes, and bottomland hardwoods.

Table 4: Current Information for Acreages of South Carolina Wetlands.

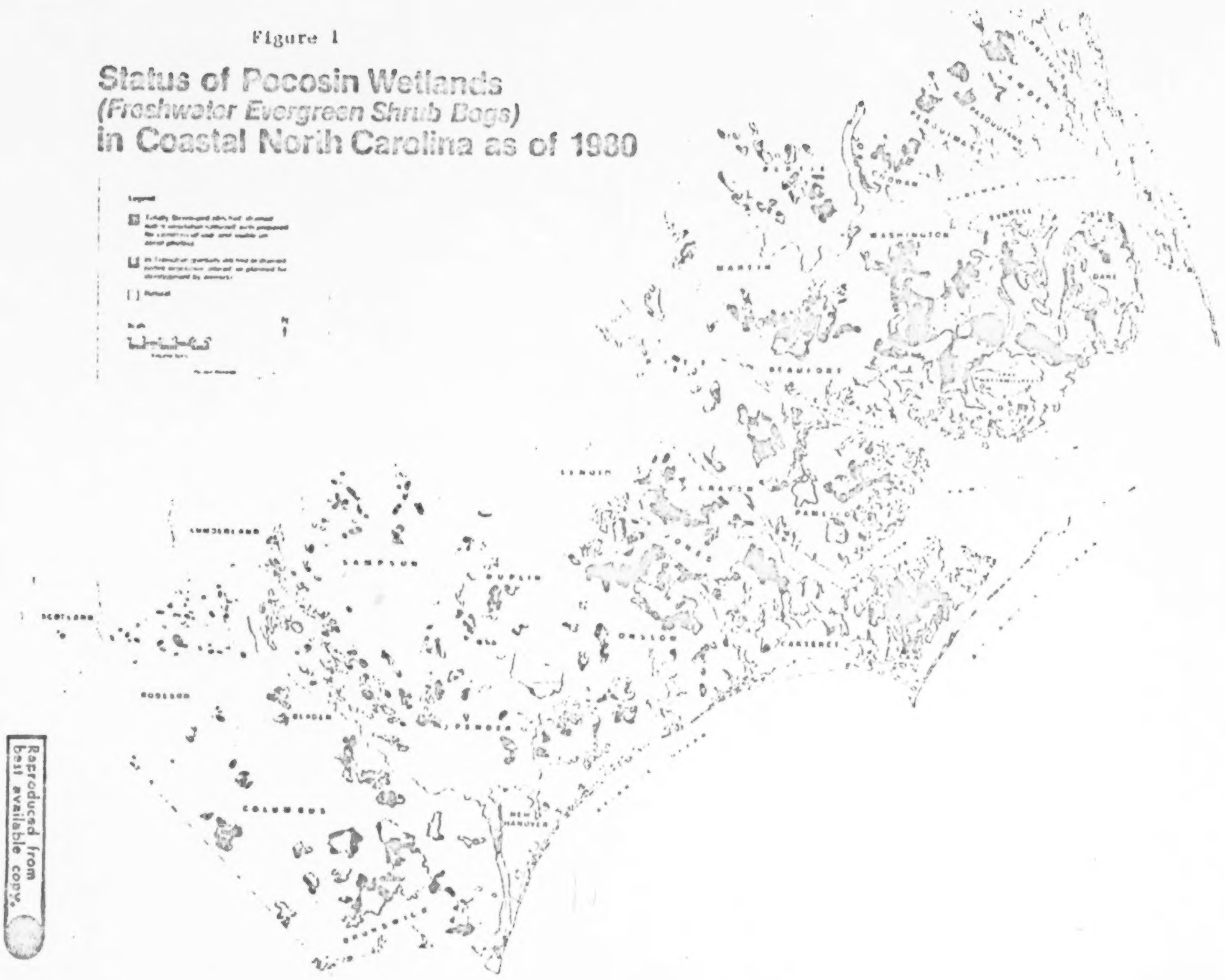
TYPE	ACREAGE	AUTHOR	PUBLICATION DATE
Bottomland Hardwood	2,268,200	Knight and McClure	1979
Low Salt Marsh	284,252	Tiner	1977
High Salt Marsh	50,249	Tiner	1977
Brackish Marsh	34,962	Tiner	1977
Fresh Marsh	64,531	Tiner	1977
Impoundments	70,451	Tiner	1977
Riverine Swamps (excluding the Savannah River Basin)	2,949,316	Hill	1973

A pocosin, an Algonquin word meaning "swamp-on-a-hill," is a freshwater wetland unique to the area extending from the southeastern coastal plain of Virginia to northern Florida. In 1962 Wilson found 2,243,550 acres of pocosin in North Carolina. By 1979 this area had been reduced to 1,503,000 acres of slightly altered or natural pocosin (Richardson, 1981). Totally developed pocosin had reached 740,000 acres, nearly 33% of Wilson's 1962 acreage of pocosin lands (Richardson, 1981). The data for the Richardson study were collected from Landsat imagery and projected onto North Carolina Department of Transportation county maps at a scale of 1 inch to 2 miles. Before 1962, less than 10% of the pocosin areas in the state had been altered from their natural condition (Richardson, 1982) (Figure 1). Sixty-five percent of the pocosin wetland in North Carolina is owned by agricultural and forest products industries whose needs have required either complete or partial drainage of those areas; only 5% are protected from drainage through public ownership or are under lease for wildlife purposes (Richardson, 1981).

The use of marshes has been regulated since 1974 by Section 404 of the Clean Water Act and more recently by state coastal management acts, but estimates of marsh loss are still scant. Spinner (1968) estimated the acreages of marsh destroyed between 1954 and 1968 to be 7.1%, or 14,700 of 206,350

Figure 1

Status of Pocosin Wetlands
(*Freshwater Evergreen Shrub Bogs*)
in Coastal North Carolina as of 1980


Legend
WASHINGTON
MARTIN
DARE
BEAUFORT
LENOIR
CRAVEN
PAMLICO
JONES
ONSLOW
CARTERET
DUPLIN
SAMPSON
CUMBERLAND
SCOTLAND
ROBESON
BLADEN
COLUMBUS
NEW HANOVER

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acres. He used Circular 39's wetland types XII, XIII, and XV-XVIII which include coastal shallow and deep fresh marshes, coastal salt flats, coastal salt meadows, and irregularly and regularly flooded salt marshes (Table 5). The species in these types of wetlands include those freshwater species affected by tides and *Spartina patens*, *Juncus romerianus*, and *Spartina alterniflora*. The data for this study were collected from the author's field surveys "made in cooperation with the state wildlife conservation agencies" (Spinner, 1969).

A study by Burdick (1967) cites a much higher percentage, 22.2%, of marshland altered. His acreage information was based on Circular 39 and Wilson's study (1962). Both Spinner's and Burdick's studies are cited extensively in the literature and the accuracy of one study over another could not be determined. The apparent discrepancy between the percentages of lost wetlands determined by the two authors may be due to Burdick's use of the term "altered" compared to Spinner's use of the term "destroyed" (Table 5).

Table 5: Acreages of Marshland Lost in North Carolina from 1954 to 1968.

	SHAW AND FREDINE (1956)	BURDICK (1967)		SPINNER (1968)	
TYPE	ACRES	ACRES	% ALTERED	ACRES	% DESTROYED
Fresh Marsh	47,500	47,016	1	--	--
Salt Marsh	158,850	113,558	28.5	--	--
Total	206,350	160,574	22.2	191,650	7.1

The alteration over time of bottomland hardwoods -- the oak-gum-cypress and elm-ash-cottonwood forest types -- to agriculture or tree-farm monoculture can be estimated using statistics on North Carolina's forest land from the Southeastern Forest Experiment Station (Boyce, pers. comm., 1982). Data from 1938 to 1974 show an intitial increase in bottomland hardwoods from 1938 to 1955, followed by a trend towards increasing loss of bottomland hardwood acreage

(Table 6). In fact, the 10.9% alteration of commercial forest land since 1964 has almost doubled compared to the 6% alteration seen from 1955 to 1964. The initial increase is partially due to a general population shift in the Southeast from rural to urban environments which resulted in a gradual reforestation of abandoned riparian farmlands. The later decrease in bottomland hardwoods stems from economic gain due to increases in agricultural lands. For instance, annual return from corn is at least twice that from natural or plantation hardwood forests (Clark and Benforado, 1980). However, absence of uniform treatment and screening of the data make it difficult to calculate the impact in terms of loss over time (Wharton, 1982). Information more recent than 1974 is not available.

Table 6: Trends in bottomland hardwood acreages in North Carolina.

	1938[1]	1955[2]	1964[3]	1974[4]
Commercial	2,340,000	3,198,700	3,005,500	2,677,873
Noncommercial	---[5]	---[5]	9,200	14,116
Total	2,340,000	3,198,700	3,014,700	2,691,989

[1] (Roberts and Cruikshank, 1941)
[2] (Larson, 1957)
[3] (Knight and McClure, 1966)
[4] (Knight and McClure, 1975)
[5] Information not available.

Finally, the Soil Conservation Service (USDA, 1977) estimated that approximately 35% of the inland wetlands, mostly Types VII and VIII, have been "lost or altered" since Wilson's 1962 study. These data were based on SCS field studies of ten sample counties in North Carolina.

B. South Carolina

As with North Carolina, no estimate of wetland trends can be made on a statewide basis for all South Carolina wetland types. Such estimates, however, may be determined for three wetland types: tidal marshes, bottomland hardwoods, and Carolina Bays.

Nonforested tidal marsh acreage decreased from 533,200 acres in 1936 (Larson, 1960) to 433,994 acres in 1977 (Tiner, 1977), a 19% loss. In 1954 the total acreage for Circular 39 wetland types XII, XIII, and XV-XVIII was 56,400 acres. Between 1954 and 1968, 2000 acres of these wetlands were destroyed either by filling or dredging, a 0.4% loss over a 14-year period (Spinner, 1968).

Bottomland hardwood areas in the state have increased slightly over the past few decades. In 1936, the USDA Forest Service surveyed the state and found a total of 2,160,200 acres of bottomland hardwoods (Larson, 1960). This acreage had increased by 5% on a statewide basis to 2,268,200 by 1977 (Knight and McClure, 1979) (Table 7). As in North Carolina, inconsistencies in the treatment and screening of bottomland hardwood data in South Carolina make it difficult to determine significant acreage loss trends over time.

The last wetland type for which acreage trends can be identified is the Carolina Bay. These evergreen shrub bogs are "elliptical depressions of the southeastern coastal plain which are consistently oriented in a northwest-southeast direction" (Sharitz and Gibbons, 1982). Carolina Bays are unique wetland types undergoing extreme development pressures. To date, 95% of these bays have been altered in South Carolina, most often for agricultural or forestry purposes (Sharitz and Gibbons, 1982).

C. Additional Information

Agency permit files provide a potential source for estimating wetland acreage loss or gain in North Carolina and South Carolina. These files provide data on the amount of wetland proposed for dredge or fill and the amount actually permitted since the early 1970's. Unfortunately, no North Carolina, South Carolina or federal agency has kept extensive summary statistics on this subject since the 1970's. The National Marine Fisheries Service (NMFS) did,

Table 7: Trends in acreages of bottomland hardwood areas and marshes in South Carolina. Sources of information included.

YEAR	WETLAND TYPE	
	Bottomland Hardwoods (Acres)	Marsh (Acres)
1936	2,160,200 (Larson, 1960)	533,200 (Larson, 1960)
1947	3,137,000 (Larson, 1960)	466,800 (Larson, 1960)
1958	2,921,300 (Larson, 1960)	527,200 (Larson, 1960)
1967	2,233,600 (Knight and McClure, 1979)	----
1977	2,268,200 (Knight and McClure, 1979)	433,994 (Tiner, 1977)

however, complete a study of permits for the year 1978 for both North Carolina (Table 8) and South Carolina (Table 9). Only coastal and adjacent counties, where marine resources are located, were included in this study; inland wetland loss is not reflected in the statistics. The total coastal wetland acreage altered in North Carolina, according to the 1978 permit information, was 65 acres; 138 acres were altered in South Carolina.

Overall, a more comprehensive statewide wetlands inventory is needed for both Carolinas to make accurate determinations of wetland trends. In North Carolina, the major emphasis of wetland inventories has been on coastal counties or areas under intensive development pressure. For instance, the Environmental Protection Agency (EPA) has recently flown and mapped the Albemarle-Pamlico peninsula where there is serious concern for wetland alteration due to heavy development pressures. East Carolina University's Atlas Project is also mapping that peninsula. The Atlas Project is discussed in more detail in Section VI.C.

In South Carolina, the major emphasis of wetland studies has been on the tidal wetlands of the coastal counties. These areas have been well mapped by

Table 8: Impact of Regulatory Programs in North Carolina as Seen in Proposed vs. Actual Loss of Acreage to Dredge and Fill Activities in 1978. Study done by National Marine Fisheries Service. (Hardy, pers. comm., 1982).

	Acreage affected								
	Proposed Habitat Loss			Actual Habitat Loss			Habitat Preserved		
Habitat Type	Dredge	Fill	Total	Dredge	Fill	Total	Dredge	Fill	Total
1. *Spartina alterniflora*	.568	3.63	4.197	.077	.145	.222	.49 (86%)	3.49 (96%)	3.98 (95%)
2. irregularly flooded salt marsh	12.10	17.32	29.42	1.84	4.00	5.84	10.26 (85%)	13.32 (77%)	23.58 (80%)
3. Water less than 5 ft. deep	52.42	8.34	60.76	28.48	7.05	35.53	23.94 (46%)	1.29 (15%)	25.23 (42%)
4. Wooded swamp	50.45	284.67	335.12	.09	23.32	23.41	50.36 (99.8%)	261.35 (92%)	311.71 (93%)
5. Submerged vegetation	.31	0.0	.31	.03	0.0	0.03	0.28 (90%)	0.0	0.28 (90%)
6. High ground to open water (gain of wetlands)				14.76 acres Type Not Specified					
Total	115.85	313.96	429.81	30.52	34.52	65.03	85.33 (74%)	279.45 (89%)	364.78 (80% ± 20)

Table 9: Impact of Regulatory Programs in South Carolina as Seen in Proposed vs. Actual Loss of Acreage to Dredge and Fill Activities in 1978. Study done by the National Marine Fisheries Service (Hardy, pers. comm., 1982).

	Acreage Affected								
	Proposed Habitat Loss			Actual Habitat Loss			Habitat Preserved		
Habit Type	Dredge	Fill	Total	Dredge	Fill	Total	Dredge	Fill	Total
1. *Spartina alterniflora*	15.24	18.56	33.8	2.93	1.07	4.0	12.31 (81%)	17.49 (94%)	29.8 (88%)
2. Irregularly flooded salt marsh	5.87	75.01	80.88	.002	66.38	66.38	5.87 (100%)	8.63 (12%)	14.5 (18%)
3. Water less than 5 ft. deep	14.52	8.49	23.01	14.52	7.84	22.36	0 (0%)	0.65 (8%)	.65 (3%)
4. Wooded swamp	7.31	46.62	54.13	0.82	41.94	42.76	6.39 (89%)	4.88 (10%)	11.27 (21%)
5. Submerged Vegetation	UNKNOWN								
6. High ground to open water (gain of wetlands)	INSIGNIFICANTLY SMALL								
7. Old rice fields proposed for impoundment a. *Spartina* b. Other	205.0 813.0	0.0	1018.0	none 2.0	0.0	2.0	205(100%) 811(99.8%)	0.0	205(100%) 811(98.8%)
Total	1060.94	148.88	1209.82	20.57	117.23	137.5	1040.67 (99%)	31.65 (21%)	1086.74 (50% ± 36)

agencies such as the U.S. Fish and Wildlife Service, the South Carolina Coastal Council, the South Carolina Wildlife and Marine Resources Department, and the Corps of Engineers. Infrared aerial photography taken in 1977 exists for the coastal areas of the state. The photographs and Landsat imagery have been extremely useful for mapping and permit purposes. Many of the resources exist for a detailed wetland study in South Carolina, but coordination and compilation are still necessary for a comprehensive analysis of wetland trends.

In summary, there are three major problems common to both national and statewide inventories:

1) The area of the state covered differs from study to study.

2) The scope of the inventory is often specific to 1 or 2 wetland types

3) The wetland definitions differ depending on the purpose of the study.

Wilson's (1962) study covers a wide variety of wetlands; however, it remains specific to 41 North Carolina coastal counties. The USDA Forest Service's Forest Statistics are statewide for both Carolinas but they estimate only bottomland hardwood wetland types. Tiner's (1977) study only discusses nonforested tidal marshes in eight coastal counties of South Carolina. And, finally, the older surveys use differing definitions or do not give precise definitions at all for their swampland inventories, which makes it impossible to compare these studies with present inventories. Even today, wetland definitions are not standard among agencies, causing much strife over delineation of wetland boundaries.

Another problem common to both states is that very little current information exists for estimates of wetland acreages. For instance, Burdick's study (1967) shows marshland alteration from 1954 to 1967 but no follow-up studies have been done. The Fish and Wildlife Service's future National Wetland Inventory will provide an up-to-date estimation of wetland acreage but on a relatively small scale. A summary of inventories can be found in Appendix B.

IV. Factors Causing Wetland Loss or Alteration

Agriculture, forestry, drainage for mosquito control, urbanization -- specifically resort and second home development -- and navigational dredging have been the primary factors causing wetland losses in North Carolina and South Carolina. The physical features of both states have encouraged these activities. The coastal plain is flat with rich soil, inviting use by agricultural and forest industries as well as providing prime areas for urbanization and second home development. The long growing season and relatively mild winters in both states are particularly attractive to agriculture, forestry and urban development.

Federal and state agency representatives and conservation groups contacted during this study believe that the major activities responsible for wetland loss or alteration differ slightly in North Carolina and South Carolina. Large-scale agriculture and silviculture are the principal factors mentioned as affecting wetland drainage in North Carolina, while urbanization, particularly second home development in coastal areas, is important in South Carolina, in addition to forestry and agriculture.

A. History of Drainage Legislation

Drainage laws were initially passed in North Carolina in the late 1800's. There laws established procedures and property rights for drainage by private landowners, corporations, drainage districts, and county governments (North Carolina General Statutes [NCGS], Chapter 156).

Beginning as early as 1754 in South Carolina, numerous local acts were passed to provide for the drainage of swamplands for agricultural development. In 1856, the South Carolina legislature passed a law permitting owners of swamp lands to incorporate for the purpose of draining the land. However, it does not appear that there was ever extensive use of this law. During the late 1800's, laws were passed, as required, to delegate the state's authority to particular counties for the purpose of draining land. In 1901, a constitutional amendment was adopted that mandated the General Assembly to provide by law for "the condemnation of all lands necessary for the proper drainage of the swamp and low land of this State..." (Wernimont et al., 1943). Under this provision, laws were passed in 1911 and 1920 that allowed for the creation of drainage districts, and established means to classify and assess the lands to be drained. These two laws -- now largely inoperative -- generally applied to all counties in the state and probably did the most to encourage the large-scale draining of South Carolina's freshwater wetlands during the first half of this century. State drainage legislation from 1920 to the 1940's took the form of amendments to the 1920 act and was generally special and local in nature (Wernimont et al., 1943).

It should be noted that the courts in these states traditionally employed the "common enemy rule" with respect to rulings on unwanted surface waters and their disposal from property. Wetlands, seen as an enemy common to the government and to private individuals, were generally deemed a liability rather than an asset. In most states, the drainage of wetlands was encouraged to promoting the public health, safety, and general welfare. However, even before the ecological value of wetlands became widely recognized, the South Carolina courts were quick to mount exceptions to the common enemy ruling, especially when such drainage constituted a nuisance to adjoining property owners (Toal, 1971).

Beginning in the 1930's, federal legislation provided the major stimulus for draining private lands in North Carolina and South Carolina. Both the Soil Conservation Service and the Corps of Engineers became administrators of resultant drainage programs. In 1936, the Soil Conservation and Domestic Allotment Act provided technical and financial assistance for farm drainage through the Soil Conservation Service and the Agricultural Adjustment Administration (now the Agricultural Stabilization and Conservation Service).

Areawide drainage became possible in 1954 with monies from the Watershed Protection and Flood Prevention Act (P.L. 83-566). Administered by the Soil Conservation Service (SCS), P.L. 566 provides aid to states for purposes such as watershed protection, flood prevention, agricultural water management, public recreation, fish and wildlife, water supply, water quality management, groundwater recharge, control of agriculture-related pollution and disposal of solid wastes (Farmer, pers. comm., 1982). Local groups needing assistance gain only technical assistance from SCS. To defray program costs, a tax assessment is levied for work done on their land. SCS details project alternatives to the local sponsor who then chooses an alternative, usually on the basis of cost estimates. These projects often deal with large amounts of land and often affect wetlands in the project area (USDA, 1981). These are considered local rather than federal projects, and are therefore not covered under the Fish and Wildlife Coordination Act of 1938 (36 C.F.R. 800). However, this large-scale alteration of streams and surrounding wetlands has provoked opposition from fish and wildlife interests concerned about the loss of productive habitat. In an effort to incorporate these concerns, P.L. 566 was amended in 1958 to provide for U.S. Fish and Wildlife Service (FWS) input. This input consists of notification of FWS when funds for a project are approved. The FWS may then fund a project investigation, and if the SCS and the local sponsoring agency agree, any resulting recommendations will be included in the project plan (Holmes, 1980).

Other more recent changes in SCS policy have encouraged wetland preservation. The National Environmental Policy Act of 1969 (NEPA) significantly affected SCS projects nationwide, largely because of the Chicod Creek Watershed court case in North Carolina. The Chicod Creek project was approved and construction authorized in 1966, but work had not begun in 1969 when NEPA was implemented. The Natural Resources Defense Council (NRDC) sued SCS over the project saying an Environmental Impact Statement (EIS) was necessary. A federal district court concurred, ordering SCS to write a Chicod Creek EIS (NRDC v. Grant, 341 F. Supp. 356). The resulting document was found to be unsatisfactory by the court (NRDC v. Grant, 355 f. Supp. 280), and further changes and compromises in the document finally produced a satisfactory EIS. Several impoundments were removed in the compromise, but cumulatively, 6 miles of stream snagging and clearing were also deleted. The court case caused several years of setback time for SCS, because the case stated that even projects approved prior to NEPA, but not yet constructed, needed EIS's (Garrett, pers. comm., 1982). Work on Chicod Creek is now complete and wetland loss equales approximately 6 acres of Type VII, 140 acres of frequently flooded Type I and 511 acres of infrequently flooded Type I wetlands (see Appendix A) (Garrett, pers. comm., 1982).

Hence, following NEPA, SCS incorporated concern for wetland protection into its procedures and later was required by Principles and Standards (See Section V.A.3.(f)) to compute watershed costs and benefits from both an environmental and a national economic perspective. The SCS Planning Memorandum Number 15 of 1975 prohibited the agency from giving technical or financial help in draining or otherwise altering wetland Types III through XX to convert them to other land uses (USDA, 1975). Finally, in 1978, FWS and SCS published joint "Channel Modification Guidelines", which are binding on both agencies (43 F.R. 8276-80 [1978]) (Holmes, 1980). SCS can still provide technical assistance causing wetland alteration in limited circumstances, but a 404 permit is required.

Acreage of wetland loss in PL-566 projects in North Carolina could not be determined. Although no new projects have been authorized since 1975 due to lack of funding, SCS personnel believe that the integrity of wetland values is maintained in current projects due to new policies (Garrett, pers. comm., 1982). Innovative mitigation techniques are being used, such as routing sheet water flow through wetland areas, to take advantage of their natural filtering system

(Farmer, pers. comm., 1982). Section V.A.3 further describes laws regulating wetland development.

The U.S. Army Corps of Engineers (COE) is also authorized to administer drainage projects under Sections 205 and 107 of the 1936 Flood Control Act (P.L. 74-738) as amended. The COE can build structures without congressional authorization where the cost is less than a prescribed figure. Wetland loss to such projects prior to the enactment of Section 404 has substantially decreased. Although the Corps does not issue itself a literal 404 permit, all of the report, study, and public interest review requirements still apply. In fact, in some senses, review procedures are more vigorous for civil works projects (Adams, pers. comm., 1982). Three projects have been authorized or completed since 404 enactment. The Black River project, completed in 1977-1978, filled 99 acres of bottomland hardwoods and swamps over a 5.1 mile stretch of the river. Joyce Creek, a project upon which work will begin next fiscal year, will modify an estimated 37 acres of swamp over a 9.4 mile stretch of the creek. Also projected to begin construction next fiscal year, the Deep Creek project will alter approximately 2 acres of swamp. This project does not require use of the 404 process as it is out of jurisdictional bounds (Adams, pers. comm., 1982). Drainage of wetlands also occurs under state administration for mosquito control. This is discussed in Section IV.D.

B. Agriculture

Agricultural development has drained many wetland areas in North Carolina and South Carolina. Drainage and conversion to arable land results in the complete destruction of the wetland ecosystem and converts the area to an agro-ecosystem with seasonally wet soils. Although the land is made economically productive, it no longer serves all the beneficial ecological values of wetlands, such as wildlife habitat, refuge for unique or rare species, flood control, water storage, and filtration of wastewater and agricultural runoff (Richardson, 1982). In coastal areas, where most new agricultural development is occurring, wetlands also serve to buffer fresh water before it enters salinity-sensitive estuaries (Richardson, 1981).

The process of converting wetlands (specifically pocosins) into farmland is an extensive, high-cost venture. First, a canal system must be dug and connected to a natural outlet. Lateral canals 10 to 15 feet deep are dug approximately half a mile apart, followed by field ditches which lie parallel to one another about 330 feet apart. Second, the land is cleared and debris is placed in windrows and burned. Third, buried wood must be removed by a bulldozer and the fields must be levelled and disk chopped (Ash et al., 1982). Barnes (1981) estimated that this conversion process could cost as much as $740 an acre.

Drainage of wetlands for agriculture in North Carolina, specifically pocosin wetlands, can be expensive and not feasible for a small farm operator. Large corporations can absorb high initial costs, however, and are able to afford to operate at a loss for several years before their farm begins to show a profit. This trend toward agribusinesses has led to a more extensive wetland drainage program. Alone, First Colony Farms on the Albemarle-Pamlico peninsula of North Carolina has required an initial $200-million investment with another $100-million dispensed since the aquisition of the land (Carter, 1975).

In North Carolina, a 1975 study by the USDA Forest Service shows a decrease in both cropland acreage and unproductive noncommercial forest land acreage. The study compiled information from three surveys (1955, 1964, and 1975) to reveal land use trends for all of North Carolina (Knight and McClure, 1975). Since 1974, however, 27,160 acres of formerly forested land have been converted to agricultural land (Ash et al., 1982). This shift toward agriculture was greatest on the Albemarle-Pamlico peninsula where three corporate farming groups acquired over 400,000 acres in a combined ownership (Carter, 1975).

In some areas of South Carolina, particularly in the vicinity of Darlington, Dillon, Marlboro and Florence counties, large-scale agriculture has destroyed many wetlands, especially Carolina Bays (Rayner, pers. comm., 1982). Only 5% of these bays still exist in their natural state (Sharitz and Gibbons, 1982). In the low country areas of the coastal South Carolina region -- Beaufort, Colleton, and Jasper counties -- extensive wetland areas have limited almost all development other than agriculture (U.S. Department of Commerce, 1979). New technology has created better equipment, seeds, pesticides, and drainage techniques to allow farming in wetland areas. More sophisticated equipment has been developed to drain wetland areas and the application of lime, fertilizers and pesticides have been refined to allow for maximum production in these areas. This technology has allowed more wetlands to be drained at less effort and cost, thus providing the impetus to increase the rate of wetland loss.

The construction of rice impoundments in South Carolina in the nineteenth century has been an important factor altering wetlands (Gould, pers. comm., 1982). Even though rice cultivation takes place in very wet areas, hardwood swamplands must be cleared before planting is done (Fairey, 1978). After planting, water levels are managed by controlling the inflow of streams or of the tide, depending on the location of the impoundments, using dikes. Doar (1936) estimates that in the 1850's, there were 72,020 acres of impounded rice fields in South Carolina. Gresham and Hook (1982) have estimated that a total of 74,113 acres of impoundments existed during the 1850's. Use of different data bases may account for the differences between these figures. Today there are 70,451 acres (Tiner, 1977), the majority of which are managed for waterfowl and wildlife (Gresham and Hook, 1982). Many of the dikes which once regulated water levels in the old impoundments have long since been destroyed and the lands have returned to their original marsh or swampland state. Recently there has been a desire by landowners to redike these old impoundments, thus destroying the wetlands which have been recreated through natural succession (Havel, pers. comm., 1982). Current regulations on wetland development have prevented much of this. In many cases where the land is now below mean high water, the state has claimed ownership. Private ownership in these areas is recognized only when the landowner is able to trace the title to his land back to a grant from a sovereign. This grant may have originated from "the Lord's Proprietors, the Crown during pre-revolutionary days, or from state grants which are no longer made" (South Carolina Water Resources Commission, 1972). Without these grants, land which had been owned by private citizens for several generations now belongs to the state.

Although trends in agricultural land acreages throughout South Carolina show a decrease from 11,021,623 farm acres in 1945 to 6,269,119 farm acres in 1974, the destructive potential of agriculture on wetlands has not decreased (Fairey, 1978). Average farm size has "more than doubled, reflecting consolidation" of farm holdings (Fairey, 1978). The present scale of farming operations has increased the intensity of the utilization of the land. Agriculture has a "positive effect on the economy . . . [although] there are potential negative effects on the coastal environment unless best management practices are employed" in dealing with agriculture in wetland areas (U.S. Department of Commerce, 1979; Richardson, 1981).

Fishermen believe that agricultural run-off has significantly degraded water quality, thereby affecting their livelihood. It is estimated that 90% of all commercial ocean organisms maintain some critical part of their life cycle in areas of estuarine waters (U.S. Department of Commerce, 1979). Total annual value of the seafood industry in North Carolina is estimated at between $250 million and $450 million (NRDC, 1981).

Discharge of dredged or fill material from "normal farming . . . such as plowing, seeding, cultivating, minor drainage, harvesting for the production of food, . . . or upland soil and water conservation practices" is exempt from Section 404 entirely (33 USC §1344 [f][1][A]). Dredged or fill material discharge is also exempt if it results from "construction or maintenance of farm . . . ponds or irrigation ditches or the maintenance of drainage ditches," or from "construction or maintenance of farm roads . . . where such roads are constructed and maintained in accordance with best management practices (?3 USC §1344[f][1][c], §1344[f][1][E]). A precise definition of "normal" agriculture does not exist, although some agribusiness farming on North Carolina's coast happened long before the implementation of 404. However, drainage of wetlands, particularly pocosins, for large agribusiness operations has been and continues to be substantial. Section VI.B details the regulatory effects of Section 404 of the CWA and the North Carolina Coastal Zone Management Act on Prulean Farms, one such agribusiness. The drainage of agricultural lands in South Carolina is regulated by South Carolina General Statute §49.

C. Forestry

Recently, the forest industry in the Southeast has been growing rapidly because of the overexploitation of "old growth" softwood fir and pines in the Pacific Northwest. Government studies predict that, within the next 30 years, all of the "economically attractive 'old growth' timber" will be completely removed from this region of the country (Natural Resources Defense Council, undated). Many large forest industries such as International Paper, Georgia-Pacific, Weyerhaeuser, and Westvaco own timberlands in the Southeast. In 27 of the eastern counties of North Carolina, these corporations own 1.6 million acres, 400,000 acres of which are wetland areas. Big paper companies own most of the 3 million acres of coastal zone timberlands in South Carolina (Hall et al., 1982). Westvaco alone owns approximately 500,000 acres of land, 20% of which are bottomland hardwood forests (Canard, pers. comm., 1982).

Both Weyerhaeuser and Westvaco indicate that due to the demand for hardwood products, bottomland hardwood areas are most profitably managed for their indigenous species (oak-gum-cypress and elm-ash-cottonwood forest types)(Canard, pers. comm., 1982; Lyons, pers. comm., 1982). It would be economically impractical to drain these lands for other purposes such as pine monoculture. Representatives from different forest product industries, however, have differing opinions of the amount of wetlands they manage and drain. For instance, a representative for Weyerhaeuser (Lyons, pers. comm., 1982) estimates that only 4% of their land is wetland and, to this date, none of the wetland has been modified. Discrepancy among sources on wetland alteration could be due to differing definitions of wetlands. For instance, Weyerhaeuser owns and manages land in the Albemarle-Pamlico peninsula, a peninsula made up almost entirely of pocosin land (Campbell and Hughes, 1981). Weyerhaeuser, however, noted no ownership of pocosin land.

Of all wetland types, pocosins have the greatest potential for production of pine pulp and saw timber (Wilson, 1962). Because of this potential, they are under particularly high pressure from timber companies as land values continue to increase. Management for timber production requires special silvicultural techniques adapted to the wet conditions of the soil. Drainage (discussed below) is the first concern in preparing an area for planting. Site preparation may include any combination of the following techniques: burning, disking, and bedding. Phosphate fertilizer, which has been shown to increase annual growth in pines, is often applied to the soil. Fire control has also been an important tool in the development of timberlands in wetland areas (Campbell and Hughes, 1981).

The high costs of establishing and maintaining timberlands in wetland areas -- between $225 and $491 per acre -- have made it less feasible for small-scale landowners to operate in these areas. A study done by Lindenmuth and Vasievich (1981) indicates that returns for intensive pulpwood plantations in pocosins can range from a low of 0.9% in a poor market to as much as 12.6% in a good market. Therefore, since they are able to provide large capital outlays, only the larger corporations can afford to obtain, maintain, and harvest pocosin areas. Carolina Bays are also under intense pressure from small- and large-scale forest industries. In South Carolina less than 5% of the bays exist in their natural state (Sharitz, 1982).

Extensive drainage programs for timberland management began in North Carolina in 1972 as a result of 1) six studies indicating that forest growth responses to drainage ranged from "a healthy 80% to a phenomenal 120%," and 2) the occurrence of an 18-month wet period causing problems for timberland managers attempting to intensify their land management practices (Terry and Hughes, 1977). As a result, a group called the Wetlands Task Force was formed to "evaluate all aspects of poorly-drained forest resources" in the North Carolina region (Terry and Hughes, 1977). The group concluded that a "controlled drainage system" was the only solution that would cover all objectives. The three priorities outlined by the Wetlands Task Force were, in order of importance:

1) the development of drainage and road systems through existing natural stands,
2) the increase of ditching intensity for site preparation of new plantations, and
3) the addition of ditches to existing plantations.

The two types of drainage most frequently employed for these projects are prescription drainage -- utilizing topographic relief -- and, where distinct drainage patterns do not exist, a grid system of ditches (Terry and Hughes, 1977).

In 1978, Doucette and Phillips estimated the extent of wetland drainage for forestry and agricultural purposes in 17 coastal counties of North Carolina and found that both agriculture and forestry activities have caused 31.6% of all wetlands to be drained in those 17 counties (Table 10). If all the potentially drainable land is drained by these two industries, 66.1% of the wetlands in these counties will have been altered. The forest industry alone has been responsible for partially draining 337,000 acres of wetlands in North Carolina, 107,000 acres more than agriculture. Forestry also owns more "potentially drainable" land than the agriculture industry (e.g. more than 44% of the pocosin wetlands (Richardson, 1981)).

Results of some Duke University questionnaires suggested that a similar trend is found in South Carolina. Forestry has been thought to have had a major impact on wetlands over the long term (Banks, pers. comm., 1982). Total forest lands in South Carolina have increased from 10,678,600 acres in 1936 to 12,502,906 acres in 1977 (Larson, 1960; Knight and McClure, 1979). No studies in South Carolina have determined the amount of wetlands affected by drainage for forestry activities (Gresham and Hook, pers. comm., 1982).

D. Mosquito Control

There are essentially two methods of mosquito control directly affecting marshland: impounding and ditching. In North Carolina, the mosquito control program is administered by the Division of Health Services. Impounding has been an "excellent" method for the control of Aedes solicitans, one of the primary pest species of mosquitos in the coastal area of the Carolinas (Oates, 1970). As of 1970, Oates reported that 3000 acres of impoundments were completed in the coastal area of North Carolina and approximately 1000 acres were under construction. Such mosquito control impoundments serve many additional purposes, including recreation or wildlife management.

Table 10: An Estimate of Wetland Drainage for Agriculture and Forestry in 17 North Carolina Coastal Counties (Doucette and Phillips, 1978).

Category and Land Use	Acres	Percent of All Wetlands
Converted Wetlands		
Farmland		
Extensively Drained	59,000	3.3
Partially Drained	171,000	9.5
Forestland		
Partial Drained	337,000	0.4
	567,000	27.1
Wetlands Potentially Drainable		
Farmland	7,000	6.0
Forestland	483,000	33.5
Miscellaneous	107,000	34.9
	597,000	33.5
Wetlands Not Drainable [1]	625,000	34.9
Total Coastal Wetland Area	1,789,000	100.0

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[1] Not Drainable - refers to coastal marshes and government owned land and urban land.

Alternatively, ditches for mosquito control are constructed in a grid pattern to remove abnormally high water from irregularly flooded marshes for the five-day mosquito breeding period following a heavy rain. This method primarily controls both *A. solicitans* and *A. taeniorhyncus* (Oates, 1970).

Burdick's (1967) study on marshland alteration and the causes for that alteration in 13 coastal counties of North Carolina indicated that mosquito control was the "single most significant activity" which affects alteration of coastal salt marshes. Of the 31,551 acres of marsh that were estimated to have been ditched and drained for mosquito control, 23,000 acres were irregularly flooded *Juncus sp.* marshes (Type XVII) (Burdick, 1967). Six percent of these Type XVII wetlands were altered by ditches and 11% were covered with spoil, a total of 17% physically destroyed (Marshall, pers. comm., 1982). Burdick also found that flooding for waterfowl management accounted for alteration of 6,468 acres of marshland (Table 11). No more current studies have been done estimating wetland loss to mosquito control activities. North Carolina Division of Health Services personnel were unable to estimate an average per project wetland loss (Perkins, pers. comm., 1982). However, the most recently approved project, Burgaw Creek, will affect 17 to 18 acres of wetlands.

Since Burdick's 1967 study, ditching for mosquito control in North Carolina has slowed markedly (Marshall, pers. comm., 1982). It fell out of favor with government officials when questions were raised concerning its efficacy and its detrimental effects on marsh organisms (Marshall, pers. comm., 1982). In some cases, drainage was found to actually accelerate mosquito breeding (Perry, 1969), and in most cases, the grid ditching done in North Carolina was found to be detrimental to marsh ecosystems (Allen and Bostian, 1982). These ditches, designed to compensate for deterioration, were deeper and wider in North Carolina mosquito control projects than in other states. The

Table 11: Acreages of marshland altered in North Carolina and the activities responsible for this alteration in 13 coastal counties from 1956 to 1967 (Burdick, 1967)

County	Land Development	Mosquito Control	Waterfowl
Beaufort			
Brunswick	2925		
Camden			
Carteret	200	4,778	
Craven	209		
Currituck			
Dare		3,000	4000
Hyde			500
New Hanover	3398		50
Onslow	1000	11,350	
Pender			
Pamlico			
Tyrrell		12,423	1918
Total	7732	31,551	6468

program of eradicating mosquitoes, involving a wholesale attempt at lowering the water level of mosquito habitat, was not directed specifically at breeding site destruction but at a general source reduction (Newton, pers. comm., 1982). The detrimental effect on other marsh organisms of the lowering of the water level contributed to the decision by government officials to find a better method of mosquito control.

At the present time, most activities directed towards mosquito control involve adulticiding or larvaeciding. Some efforts have begun in the area of open marsh management, a technique which involves shallow ditching in marsh areas, without any grid pattern. This technique has proved to be less harmful to the marsh ecosystem while, at the same time, providing effective mosquito control.

Permit granting agencies have been reluctant to grant permits for mosquito control activities affecting wetland areas for two reasons. First, the success of mosquito control techniques has been questioned and, second, in some cases like that of Burgaw Creek, evidence of a mosquito control problem has been hard to document (Wright, pers. comm., 1982). Such proof is necessary to fulfill public need requirements of the Section 404 permit process.

In South Carolina, the Department of Health and Environmental Control (DHEC) has authority to promulgate rules and regulations for the control of disease-bearing insects, including the impounding of waters. Permits to impound water are issued subject to the following conditions:

1) all emergent vegetation must be removed,
2) all depressions forming separate pools must be drained, and
3) all shoreline brush and undergrowth must be removed (SC §R62-45).

Due to the present difficulties involved in obtaining permits to ditch or dredge for mosquito control, these activities have not had any recent major effects on the areal extent of wetlands in South Carolina (Loving, pers. comm., 1982). Most mosquito control programs have involved eradication using insecticides aimed at the larvae or the adult stages of the insect's life cycle. These insecticides are either applied by air or ground spraying of infested areas. Mosquito control is done on the basis of surveillance data. When larvae or adults are found by inspections or reported by complaints, these specific areas are treated; wide area control for the pests is not used. The effects of agriculture, forestry and urbanization have been much more significant in wetland loss than mosquito control activities in South Carolina.

E. Urbanization and Second Home Development

Since 1950, second-home development in the South has accelerated (Burby, 1979). Coupled with other increases in urban development, this acceleration has had an important impact on wetland loss in coastal North Carolina and South Carolina.

Since state and federal agencies began requiring dredge and fill permits, much of the potential dredging for marinas and filling for residential homes has been prevented. It has not, however, been stopped completely. Runoff of storm water from developed areas into marshes and swamps and the discharge of sewage into wetlands are some threats from urbanization that still exist (Gould, pers. comm., 1982). Because of the sensitivity of wetlands to disruption from "development and attendant pollution [they] require special planning and preservation efforts so that their ecological, aesthetic and recreational values remain unimpaired" (U.S. Department of Commerce, 1979). The development of Hilton Head Island is an example of a project in which this type of planning has been undertaken for the preservation of marsh areas (Section VIA).

In a study of the 23 barrier islands off the North Carolina coast done by the Geological Survey (Lins, 1980), the changes in land use of the islands from 1945 to 1975 include an increase in urban development of 15,763 acres, or +269%, while forestlands and wetlands both decreased. Between 1950 and 1970, North Carolina's share of the national second home housing stock had increased from 1.3% to 3.1% to rank North Carolina ninth in number of second homes in the United States (Burby, 1979). The Council on Environmental Quality (CEQ) estimates that the most significant increases in second home development on the coast have yet to occur (Burby, 1979). Five reasons are given for this expected increase (Burby, 1979):

1) Additional discretionary incomes will become available to a larger group of people.
2) Individual leisure is increasing.
3) The number of people choosing early retirement is increasing.
4) The people from the post World War II baby boom will be of the right age for such an investment.
5) Improved highway systems increase accessibility of these islands.

In 1976, the number of recreational lots in high, medium, and low development coastal counties was 83,690 compared with 20,530 leisure homes in 1970 (Burby, 1979). At present, of the 20 counties in North Carolina that border salt water, four are gaining new residents at two to six times the rate of the state as a whole because of the boom in several retirement and resort beach areas (Miller, 1982). In a survey examining developers' expectations of the market for recreational property in North Carolina, Burby (1979) found that 47% of the developers predicted that over the next ten years, coastal development will expand, 33% predicted it would remain stable, and 20% predicted a decrease in coastal development.

Homeowners or landowners on the coast of North Carolina may be experiencing some effects of the combined state and federal regulatory programs. In a 1980 study of seven selected beach communities, two had been significantly affected by regulatory programs, both due to the setback requirement which requires a minimum distance from the shoreline for construction. In a shallow lot, such a requirement, when coupled with local ordinances requiring setback from the street can preclude construction (Liner, 1980). One owner affected by setback requirements received a lowered property tax valuation from $12,500 to $500 (Liner, 1980). However, the study concludes that although regulatory permit decisions "may have altered construction standards and methods of development, in general regulating under CAMA and the Dredge and Fill law have not substantially restricted the ability of landowners to use their land, and consequently that the regulations have not had a significant impact on land value" (Liner, 1980).

In South Carolina, urbanization has been ranked as one of the most important causes of wetland destruction, particularly in the tidal marshes of the state (Rayner, pers. comm., 1982). Second home and resort development on the South Carolina coast have already contributed to large decreases in coastal wetland areas. Thirty percent of the peninsula of Charleston was marsh 150 years ago, but has since been filled (Dunlap, pers. comm. 1982). Other areas such as the Grand Strand area have become well developed due to the easier accessibility of beaches in this part of the state compared to those in the Sea Island area (U.S. Department of Commerce, 1979).

Urban areas in South Carolina have increased from 499,500 acres in 1936 to 676,500 acres in 1958 (Larson, 1960). On the barrier islands of the state, this trend is even more pronounced. Between 1945 and 1975, wetland areas decreased by 6,853 acres, or 6.0%, of the original 107,802 acres in 1945. Urban areas on the barrier islands increased by 11,427 acres (+691%). Agricultural and forest lands have decreased by 47% and 4% respectively during this same time period. Hence, this increase in urban area resulted in reduction of agricultural and forested lands. Without the existing legislation, the state would have lost much more marsh land to development (Havel, pers. comm., 1982).

Industrial development has been given a high priority in some of the more economically stressed counties of South Carolina. Along the Savannah River, in particular, wetlands areas have been affected due to increased industrial development. The added economic benefits of industry in these areas have been welcomed by the residents of these counties at the expense of a small area of wetlands (Aichele, pers. comm., 1982).

Three coastal counties, Berkeley, Charleston, and Dorchester, all have large wetland areas: 15% of Berkeley, 22% of Charleston, and 25% of Dorchester counties (U.S. Department of Commerce, 1979). In some regions, such as Beaufort and Colleton counties in South Carolina, the extensive areas of marsh have slowed potential urban development. Thirty-six percent of the land area of Beaufort county is wetland while only about 6% of the county is in residential commercial or industrial uses.

F. Corps Projects

In addition to the flood control capabilities discussed under drainage, the COE also alters wetlands in maintaining navigable waterways and in constructing multipurpose reservoirs. A CEQ (1981) document stated that, "along the Atlantic Coast the single most extensive use of reclaimed wetlands has been for the development and maintenance of navigable waterways." None of the wetland trend surveys discussed in the previous section have considered the U.S. Army Corps of Engineers (COE) projects to be prominent factors influencing wetland trends in North Carolina and South Carolina. The COE does not issue permits to itself, but regulations do require environmental assessment, an environmental impact statement if necessary, selection of dredge disposal sites in accordance with EPA 404(b) guidelines, application of the wetland policy, public notice, consultation with the U.S. Fish and Wildlife Service and opportunity for public hearing (FR 209.145, 1979).

Impacts of navigational dredging include modification of harbor hydrology, salinity changes and water quality degradation, in addition to the problems associated with dredge disposal. Multipurpose reservoirs affect wetlands by degrading water quality, changing aquatic habitats and altering the character of downstream coastal marshes (U.S. Department of Commerce, 1979). Also, fluctuating water levels and boat-wake waves can keep wetland communities from establishing on the reservoir fringes (Adams, pers. comm., 1982). North Carolina COE reservoirs include John H. Kerr, Jordan Falls (near completion) and W. Kerr Scott. Randleman Reservoir is planned (Adams, pers. comm., 1982).

In South Carolina, controversy exists over the Santee River rediversion project. The river was originally diverted from its natural basin as a means of flood control. At the present, the COE would like to redivert the river into its old channel in order to reduce siltation in the Charleston harbor. The shellfishers of the area are not pleased with the proposed change because rediversion may destroy the clam and oyster beds present at the mouth of the old river. In the long run, however, the increased flow will most likely improve the subtidal oyster beds (Hall et al., 1982). Although other effects of the rediversion project have not been documented, it has been predicted that this project may result in a change in the species composition of the area and a "decrease in total wetland acreage" (Hook, pers. comm., 1982). The project will, however, provide a decrease in the siltation of the harbor, thus reducing the frequency and extent of dredging necessary to keep the harbor deep and unobstructed. It is still not known whether the benefits of such a project will outweigh the costs (Hall et al., 1982). Ben Gould of the Charleston District Corps of Engineers has suggested that navigational dredging and other Corps projects have had some effect on wetland destruction, but these activities compared to forestry, agriculture and second home development are not the most destructive ones in wetland areas of the state (Gould, pers. comm., 1982).

G. Summary

No one factor is most important in wetland destruction in North Carolina and South Carolina. A combination of pressures from several industries and activities has led to a decrease in the extent of wetlands in these states.

1) In North Carolina, forest industry owns more drained wetlands than the agricultural industry, but the actual effects of agricultural drainage are more detrimental. The present trend is towards forest and wetland conversion to agriculture.

2) The effect on wetlands of these industries in South Carolina has been similar. In some areas, one industry is more prevalent than the other, therefore producing greater local wetland destruction.

3) Mosquito control has been a problem in North Carolina in the past.

At present it is not as important as either forestry or agriculture in the alteration of wetlands.

4) In South Carolina, mosquito control drainage has had little effect on the extent of wetlands.

5) Urbanization, particularly second home development, is a problem on the barrier islands of both North Carolina and South Carolina. Trends toward increased development in these areas indicate future destruction of wetlands.

6) Although navigational dredge and fill is very detrimental to wetlands and surrounding aquatic environments on the Atlantic coast, in North Carolina and South Carolina this activity has had less impact on wetlands than others such as agriculture or forestry.

Determination of a single activity having the greatest adverse impact on wetland areas can only be made on a regional basis.

V. Factors Encouraging Wetland Preservation

A. Federal

1. Corps of Engineers regulations - Section 404

(a) National program description

Discharge of dredged or fill material into the waters of the United States is primarily regulated by Section 404 of the Clean Water Act of 1972 (officially, the Federal Water Pollution Control Act, P.L. 92-500), amended in 1977 (33 U.S.C. §1251). The purpose of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States (33 U.S.C. §1251). Thus, before dredged or fill material may be discharged into waters of the United States, the Corps' 404 program requires that adverse environmental impacts and other impacts affecting the public interest be evaluated.

The U.S. Army Corps of Engineers (COE) has primary permit responsibility for the 404 permit program and reaches permit decisions through its public interest review process. The Environmental Protection Agency (EPA) has the responsibility to ensure that its 404(b) guidelines are satisfied. The Corps can override EPA guidelines for navigational reasons, while EPA may prohibit or restrict dredged or fill discharge from a defined site if, after evaluating the discharge effect through public notice, consultation with the Corps, and opportunity for public hearing, the agency decides the discharge might have unacceptable adverse effect on a municipal water supply, wildlife, recreation areas, or shellfish beds and fishery areas, including spawning and breeding grounds (33 U.S.C. §1344[c]). A permit has never been denied due to the 404(b) guidelines alone (Hollis, pers. comm., 1982).

Other responsibilities of EPA in the 404 program include review of Section 404 permit applications, determination of jurisdictional limits for "waters of the United States" in special designated areas, and determination of the adequacy of state programs for the assumption of the 404 permit process in other than navigable waters. EPA has designated only two areas in which it will make jurisdictional determinations, neither of which affects North Carolina or South Carolina (45 F.R. 45,018 [1980]). Finally, EPA can legally bring enforcement actions against those violating or neglecting to obtain a permit. Staff members at regional EPA offices are assigned particular states in which to work with federal and state personnel concerning 404 activities (EPA, 1979).

Other federal agencies are also involved in the 404 program. To minimize duplication, needless paperwork, and delays in permit issuance, and to the maximum extent possible make permit decisions within 90 days of a public notice, Congress requires the COE to enter into agreements with EPA, the U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS) (33 U.S.C. §1342[q]). Similar agreements exist with the departments of Agriculture and Transportation. These agreements, termed "Memorandas of Agreement" (MOA's) or "Memorandas of Understanding (MOU's), ensure the meeting of deadlines in the reviewing process. New COE regulations were printed in the July 22, 1982, Federal Register (47 F.R. 31,794-31,834). In addition, new MOA's were signed earlier in the month. Previously, federal agencies at the regional level were allowed to refer objectionable COE decisions to higher authorities for further review. Although the final decision to 1) approve, 2) approve with specified conditions, or 3) deny a permit was proposed by the COE District Engineer, objections from federal review agencies could result in the "elevation" of the project application to the COE Division Engineer for further review prior to a final decision (45 FR 62,763, 62,769, 62,772 [1980]). With sustained unresolved objections, or in especially significant cases, the application could be further elevated to the Chief of Engineers (33 C.F.R. §325.8[d][1981]). The new regulations, however, significantly cut back on the elevation power of the reviewing agency regional level offices. Under the 1982 regulations, a field or regional agency office must now ask their Washington level office to request that the Assistant Secretary of the Army review a permit which the COE plans to issue. The Assistant Secretary will decide which level within the Army (Division/Region, Office of the Chief of Engineers/Washington agency staff, Assistant Secretary of the Army) will review the permit application. This limits the higher authority review to one level, and COE staff believe that it will considerably decrease the time involved in the permit review process (Hollis, pers. comm., 1982).

To consider both costs and benefits to the public of wetland alteration, the COE requires a public interest review as a part of each permit application procedure (33 C.F.R. §3204[1981]). The COE considers the need for the project, the existence of alternative nonwetland sites, the cumulative effects of similar or nearby projects, and the project effects on historic, scenic and recreational values, water quality, and fish and game (33 C.F.R. §320.4[a][2][1981]).

Where permit overlap occurs between Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899, also administered by the COE, a joint public review is conducted. Thirty days are typically allowed for this public interest review (EPA, 1979).

Two parts of Section 404 allow for activity exemptions. First, under Section 404(f) of the CWA, certain discharges are exempt from regulation. These activities include normal silviculture, normal agriculture, and construction or maintenance of farm or forest roads where Best Management Practices (BMPs) are used. Second, Section 404(r) of the CWA provides an exemption for projects authorized by Congress, and entirely planned, financed, and constructed by a federal agency. However, an Environmental Impact Statement (EIS) must be prepared for these cases under both EPA and COE guidelines, and it must discuss effects of the discharge. Many COE projects fall under this category.

The COE issues three kinds of permits. An individual permit is most often required for dredged or fill material discharge. A regional general permit may be approved for activities in well-defined, relatively small geographic areas where the activities cause minimum individual or cumulative impact (33 U.S.C. §1304[e][1]). Under this option, the District Engineer specifies appropriate conditions to be satisfied before or during the work in order to qualify for a general permit. A nationwide general permit may be issued by the Chief of Engineers for certain activities throughout the nation such as fill for utility and minor road crossings or for discharges into minor waters (EPA, 1979).

Nationwide permit 33 C.F.R. §323.4-2 deserves particular mention. It conditionally allows discharge of dredged or fill material into the waters of the United States for "[n]on-tidal rivers, streams and their impoundments including adjacent wetlands that are located above the headwaters" (33 C.F.R. §323.4-2[A][1][1979]) and for "natural lakes, including their adjacent wetlands, that are less than 10 acres in surface area and that are fed or drained by a river or stream above the headwaters" (33 C.F.R. §323.4-2[A][2][1979]). Headwaters are defined as the point on a nontidal river or stream where the average annual flow rate is less than 5 cubic feet per second (cfs). Under the 1982 regulations, the Chief of Engineers may use "discretionary" power to deny a nationwide permit where there is adverse environmental or aquatic impact. Also, the Division Engineer has the ability to allow localized conditions to be placed in specific nationwide permits.

The CWA protects navigable waters, which are defined by the act to include all "waters of the United States" (33 U.S.C. §1362[7]). In 1974, the COE revised their regulations to administer the 404 permit program but kept the traditional definition of navigable or "Section 10" waters for "waters of the United States" (33 F.R. 12,115[1974]). However, a 1975 court decision, NRDC v. Calloway (392 F. Supp. 685), caused the COE to redefine "navigable" waters in the broader sense for the purposes of 404, and ensuing COE regulations defined navigable waters falling under CWA protection as those in which pollution "could affect interstate commerce" (33 C.F.R. §323.2[A][5][1979]). Due to the changing hydrologic system of surface waters, the regulations also gave the Corps the responsibility under Section 404 for the effects of dredged and fill material on wetlands adjacent to navigable waters. "Wetlands" were defined as "areas that are periodically inundated and normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction" (40 F.R. 31,324[1975]). These regulatory definitions substantially changed the Corps' role in regulation of the nations's wetlands. In 1977, the COE again revised the wetland definition, this time to read "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (42 F.R. 37,122 - 37,144[1977]).

The COE is currently considering a five-point regulatory reform package designed to: 1) reduce uncertainty and delay, 2) delegate more permitting responsibility to the states, 3) reduce overlapping programs and policies, 4) expand use of general permits, and 5) clarify the scope of the permit program (COE, 1982). These points are addressed individually under the program evaluation section.

(b) Wilmington District program description

The Wilmington District COE has fourteen staff members working with the 404 permit program. Six area coordinators report to the Chief of the Processing Section, and are each responsible for permit coordination, field visits, and enforcement in specified counties. Two COE regulatory staff members are solely responsible for large difficult permit cases. They report to the head of Enforcement and Environmental Assessment. One field enforcement coordinator, two clerical staff, and the head of the Regulatory Functions Branch, complete the 404 regulatory staff (Hollis, pers. comm., 1982).

Pre-application consultations occur in approximately 40% of all permit applications, and in 100% of all major or significant project applications. These often help determine whether or not a permit is needed for a project. Most result in project changes that reduce the area of wetland affected (Wilmington District COE, 1982, Hardy, pers. comm., 1982). Wherever possible, the Wilmington COE conducts joint on-site visits and pre-application meetings with EPA, FWS, NMFS, the North Carolina Office of Coastal Management, and other state agency representatives. Agency representatives believe they are invited on a pre-application basis by the COE to most if not all sites of interest to them (Hardy, pers. comm., 1982). Such coordination allows agency personnel to meet applicants and solve many potential problems in the early stages of a project (Wilmington District COE, 1981b).

Residents of the coastal counties seem to be informed of the possible need for a 404 permit. One study noted that 88% of a sample population in seven counties was aware of the dredge and fill permit requirement, and 63% of those surveyed were very familiar or somewhat familar with the law (Urban Institute, 1978).

After a permit is filed with the COE, a 30-day public review period follows. In mid-1982, a joint public notice system between the Wilmington District COE and the North Carolina Office of Coastal Management was initiated for projects needing both state and 404 permits. In these cases, agency comments would count both as a public interest review and as a state consistency statement (see Section V.B). Review agencies are again invited by the COE to look at every nonroutine permit application in which they might be interested. Agency representatives may visit the site at this time if no pre-application site visit was made, or if the permit as filed did not incorporate their suggestions given at the time of the pre-application site visit (Hardy, pers. comm., 1982).

At this point in the permit process, the COE may choose to issue, issue with conditions, or deny a permit. Review agencies agree that the Corps generally incorporates their conditions and that, in many cases where the agencies have permit objections, it is typical for the Wilmington District to have a post-application meeting with the applicant to work out the differences. NMFS staff say that they know of no post-application meeting to which they were not invited (Hardy, pers. comm., 1982). The advantage they see to this approach is that the COE knows what was said in discussions between reviewing agency staff and the applicant.

In addition to joint public notices, further streamlining has occurred in North Carolina due to a new Wilmington District COE general permit. In early 1981, the Corps issued a general regional permit for all activities also requiring and receiving all of the following: a state major development permit under the North Carolina Coastal Area Management Act, a state dredge and/or fill permit, an easement to fill state lands, and a 401 water quality certification. The State Office of Coastal Management does the field work for the application, and furnishes the report to federal agencies who comment to the COE, at which time the Corps comments to the state. COE conditions are included if the state issues the permit. This permit covered 80% of all major projects in 1981. A copy of the permit is found in Appendix E. Appendix C summarizes other Wilmington District COE general permits.

Ninety-five percent of all permits issued by the Wilmington District include conditions or modifications of some kind. From 1977 to 1981, the North Carolina COE issued an average of 159 permits involving 404 (i.e., permits for Dection 404 or Sections 10/404), 49% of all permits issued by the District. Ninety percent of these permits included conditions or restrictions of some kind on the project, but only 20% of the permits contained "substantial" project modification (Wilmington District, 1982).

Little compiled data exist on the magnitude of the effects of dredge and fill permits, although field reports for each permit are filed with regional COE offices. In 1978, NMFS did a study in which proposed acreages in 404 and 10/404 permits for dredge and fill were compared to acreages actually permitted. The difference provides one assessment of the effect of the COE regulatory program. Only coastal and adjacent counties where marine resources are located were included in the study; hence, inland wetland loss is not reflected in these statistics. NMFS found that a total of 365 acres of wetland habitat were preserved via the North Carolina regulatory program in 1978, which is 85% of the total proposed for loss in permits. This information is summarized in Table 8.

The Corps acted on (issued or denied) from 52% to 59% of the applications they received from 1977 to 1981. In the same time period, from 90% to 97% of the applications acted on were issued, with or without conditions (Wilmington District COE, 1977, 1978, 1979, 1980, 1981a). Permit summary statistics for the COE regulatory program from FY 77 through FY 81 are shown in Table 12.

During the past five years, the COE denied 3% to 5% of all permits acted upon involving 404. The Corps found the three most important reasons requiring permit denial to be 1)wetland destruction where there were viable alternatives to accomplish the same goal, 2) denial of a state Coastal Area Management Act permit, and 3) potential destruction of shellfish and nursery areas (Wilmington District COE, 1981b).

In FY 80, the Wilmington COE devoted approximately 15% of their regulatory effort to enforcement activities (Wilmington District COE, 1981b). Corps or state personnel check 100% of all issued permits, both routine and nonroutine, for compliance. The COE conducts statewide aerial checks once every two to three months and receives monthly fly-over reports from the Office of Coastal Management which flies the coastal area twice a week. Color aerial photography has been obtained jointly by the COE, NMFS, FWS, EPA, and the state Office of Coastal Management, allowing the agencies to work from the same data base in the evaluation of projects (Wilmington District COE, 1981b).

Violating a permit condition is termed a "violation," while neglecting to obtain a permit when necessary is termed an "illegal." Both types of activities are treated similarly by the COE. Project compliance with the issued permit is perceived as generally good both by state and federal agency staff. The 1978 Urbal Institute study examined a sample of permits for compliance with conditions. The most violated condition was the revegetation requirement, which was not completed in 47% of the projects. Spoil containment permit provisions were violated in 24% of the cases, and spoil placement conditions were violated 15% of the time. Conditions concerning placement and nature of fill material were violated 9% of the time, and in only 2% of the permits were specific

TABLE 12. PERMIT STATISTICS FOR THE WILMINGTON DISTRICT COE,
FY 1977 - FY 1981
(404 and 10/404 permits)

	FY 77	FY 78	FY 79	FY 80	FY 81	AVERAGE
New applications received	242	280	186	173	178	212
Number of applications acted on †	202	212	174	122	134	169
(% of total 404 and 10/404 permits)	52%	55%	59%	54%	59%	
Number of permits issued	181	203	165	116	130	159
(% of permits acted on)	90%	96%	95%	95%	97%	
Number of permits denied	8	9	9	6	4	7
(% of permits acted on)	4%	4%	5%	5%	3%	

† Number of applications acted on = new applications + applications pending from last yar - cancelled or withdrawn applications - applications pending for next year.

Source: (Wilmington District COE; 1977, 1978, 1979,a, 1980, 1981a.)

structure dimensions exceeded. Overall, full compliance with all permit requirements occurred in 54% of all cases. This percentage has increased dramatically over the years (Urban Institute, 1978).

More recently, the NMFS has assessed permit compliance with permits conditioned by federal agencies in North Carolina's coastal and adjacent counties. In 1981, NMFS site-checked 23 projects. In 100% of these projects, the Wilmington COE had issued the permit containing conditions and/or modifications as suggested by NMFS. Five of the projects had not begun work at the time of review, and two others, although begun, were not complete. Of the 18 projects completed, three cases (17% of the completed projects) had not been done in accordance with the permit. All three cases were reported to the COE.

In 1982, 22 projects were site-checked in North Carolina by NMFS. In one case, NMFS conditions were not incorporated into the permit, and it was issued over their unresolved objections. In 6 of the remaining 21 permit applications (29%), the project was retired, i.e., cancelled or postponed, because the applicant was unwilling to comply with NMFS recommendations. Two of the 6 retired projects were modified and completed under a general permit. Eleven of the remaining 15 projects were completed, all in compliance with the permit as issued. Four of the 15 projects were incomplete, and 3 of these were discussed with the COE for possible noncompliance; all 3 were resolved to the satisfaction of NMFS without further action. NMFS personnel say that these statistics for both 1981 and 1982 represent the good cooperation which exists betweed their agency and the Wilmingtion District COE (Hardy, pers. comm., 1982).

For 1978, NMFS estimated that known illegal activities in North Carolina destroyed about 12 acres of wetlands. This included 0.43 acres of Spartina alterniflora filled, 0.45 acres of water less than 5 feet deep filled, 9.59 acres of wooded swamp filled, and 0.002 acres of wetland areas dredged (Hardy, pers. comm., 1982).

The Wilmington District COE averages 68 new violations or illegals a year involving formal correspondence. Another 50-60 minor violations or illegals per year are handled informally. The Wilmington District COE has two staff members who work with illegals and who conduct a COE investigation whenever one is reported. After-the-fact permits, voluntary restoration which negates the need for a permit, or some combination of the two resolve 90% of these illegals. Restoration, voluntary or mandated, involves replacing elevations, contours, and natural vegetation. The COE checks 100% of those sites requiring restoration for compliance with the restoration procedures (Hollis, pers. comm., 1982). Summary violations statistics are contained in Table 13.

Reviewing agency personnel say that most illegals are discovered in North Carolina through the combination of aerial surveillance systems, the COE ground personnel network, and "neighbors," or private citizens concerned about work in their area. Approximately 15% of violations are reported by conservation groups or citizens (Wilmington District COE, 1982). The 1978 Urban Institute study found only seven undetected illegals in the seven coastal counties examined. The study also attributes this low rate to the comprehensive surveillance methods employed in the state (Urban Institute, 1978). No similar study exists for South Carolina.

An annual average of 11% (approximately eight cases) of violations or illegals investigated are referred to the U.S. Attorney's office for litigation. The Corps sends copies of "Cease and Desist" letters and subsequent correspondence to the U.S. Attorney's Office and to all review agencies. The U.S. Attorney then sends a letter to the violator stating that a file for his case has been opened. Such measures keep all parties informed and add legal weight to negotiations which encourage voluntary resolution, thereby reducing the number of cases requiring litigation (Wilmington District COE, 1981b).

TABLE 13. VIOLATION AND ILLEGAL ACTIVITY STATISTICS FOR THE WILMINGTON DISTRICT COE,
FY 1977 - FY 1981
(404 and 10/404 permits)

	FY 77	FY 78	FY 79	FY 80	FY 81	AVERAGE
New violations and illegal activities reported	42	61	80	74	81	68
Number of violations or illegal activities acted on†	44	69	77	70	74	67
(% of total 404 and 10/404 permits)	43%	63%	58%	61%	59%	
Number of after-the-fact permits issued	17	4	6	6	13	9
(% of violations acted on)	39%	6%	8%	9%	18%	
Number of violations or illegals litigated	1	26	2	7	0	8
(% of violations acted on)	2%	26%	2%	7%	-	
Number of violations or illegals where no permit was necessary	17	39	71	57	61	49
(% of violations acted on) (voluntary restoration)	39%	57%	92%	81%	82%	

† Number of violations acted on = new violations + violations pending from last year - violations pending for next year.

Source: (Wilmington District COE; 1977, 1978, 1979a, 1980, 1981a.)

To further establish lines of communication, the COE and the state Office of Coastal Management have held bimonthly joint enforcement meetings since 1972 with representatives from other interested federal and state agencies. Policies, regulations, procedures and specific problem permits and violations are discussed, and this encourages the "airing and resolution of problems in an informal atmosphere" (Wilmington District COE, 1981b).

EPA staff members often participate in pre-application consultations and on-site visits. They also attend all scoping meetings, and are involved in any EIS matters. Of the permits or which EPA comments, approximately 40% to 50% are "minor", 40% are "important", and 10% are "major" (Brad Nicolajsen, pers. comm., 1982).

(c) Charleston District program description

The Charleston District has a regulatory staff of five professional and eight technical positions. Three people are responsible for enforcement and inspection. Due to limited field staff, the Charleston District relies heavily on other agency personnel, particularly Soil Conservation Service field representatives, to identify and refer activities that require permits. Corps personnel believe, however, that most individuals in the coastal zone are aware that planned construction may require a dredge and fill permit. The regulatory staff usually conducts a field visit within a week of notification and informs the individual within a week of the field visit as to whether or not a permit is required. Visits to minor inland sites are not always made due to limitations on time and staff. Instead, the Corps focuses its efforts on coastal areas and major development (Gould, pers. comm., 1982).

As in North Carolina, the Corps program in the Charleston District is tied closely to state permitting programs. Although there is no joint application form, the Charleston District does issue joint public notices for projects that are also of concern to state permitting agencies. Once the public notice is issued, state and federal agencies recommend approval or denial of the proposed action. In the coastal counties, state recommendations are submitted to the South Carolina Coastal Council. In the remainder of the state, they are sent to the South Carolina Water Resources Commission. These agencies consolidate state comments and forward a recommendation for denial or approval to the Corps and other appropriate federal agencies.

The Charleston Corps has issued six general permits, authorizing categories of work within particular geographical areas (see Appendix D). These permits are issued subject to the review and approval of the designated government agency having jurisdiction in that area, which relieves the Corps of monitoring certain activities there.

The Charleston District places emphasis on enabling applicants to avoid the need for a dredge and fill permit. Most consultations, both formal and informal, result in some type of modification such that the proposed activity does not affect wetlands. The current staff believes that the number of acres of wetlands lost under Corps jurisdiction since 1972 has been extremely small.

Forty-seven percent of all permits issued by the Charleston District from October 1977 to April 1982 involved Section 404 (Charleston District COE, 1977, 1978, 1979, 1980, 1981a). Conditions or project modifications of some kind were included in 30% of all permits issued (Charleston District COE, 1981a). The District acted on (issued or denied) 56% of the applications involving 404. The remaining 44% were carried over to the next fiscal year. Ninety-two percent were issued from 1977 to 1981, with or without conditions. Permit summary statistics for the Charleston District regulatory program from FY 1977 through FY 1981 are shown in Table 14. The 1978 NMFS study found that 1086 acres of wetland habitat were not permitted and hence were preserved via the regulatory program. This represented 90% of the acreage proposed for permitting and consisted mostly of rice impoundments (Table 9).

TABLE 14. PERMIT STATISTICS FOR THE CHARLESTON DISTRICT COE,
FY 1977 - FY 1981
(404 and 10/404 permits)

	FY 77	FY 78	FY 79	FY 80	FY 81	AVERAGE
New applications received	192	179	225	221	224	208
Number of applications acted on †	170	158	156	165	207	171
(% of total 404 and 10/404 permits)	63%	62%	62%	61%	74%	
Number of permits issued	156	145	141	155	191	158
(% of permits acted on)	92%	92%	95%	94%	92%	
Number of permits denied	14	13	15	10	16	14
(% of permits acted on)	8%	8%	10%	6%	8%	

† Number of applications acted on = new applications + applications pending from last year - cancelled or withdrawn applications - applications pending for next year.

Source: (Charleston District COE, 1977, 1978, 1979, 1980, 1981a.)

During the past five years, the Charleston District COE denied 6% to 10% (13 to 16 cases annually) of all applications acted on involving Section 404. The Corps found the three most important reasons for denying a permit to be (1) existence of feasible alternatives, (2) lack of public benefits in the face of public detriments, and (3) cumulative impact considerations (Charleston District COE, 1981b).

In FY 1980, the Charleston COE devoted approximately 20% of their regulatory effort to enforcement activities. The District receives an average of 155 new violations each year involving both formal and informal consultations. Ninety-five percent of the violations are resolved with after-the-fact permits, voluntary restoration which negates the need for a permit, or some combination of the two. Summary violation statistics are contained in Table 15.

Although the percentage of permitted projects the COE is required to monitor was recently decreased from 90% to 10%, few violations are currently missed due to sufficient aerial surveillance. This 10% largely involves nonroutine projects. Most violations tend to be minor and unintentional, and are handled through permit modifications. The Charleston COE conducts aerial surveys twice a month in cooperation with the SCCC (Gould, pers. comm., 1982).

In 1981, NMFS investigated 15 projects, all of which had been issued permits incorporating NMFS conditions and modifications. Seven of these projects had been started and 5 of those had already been completed. In 2 cases the applicant had not done the work in accordance with the permit (40% of completed projects), however, in both cases the deviations were minor. In 1982, NMFS investigated 14 projects, 11 of which were permitted and [illegible] of which were unauthorized (illegals). Nine of the 11 projects were completed. In 3 of these (33% of completed projects), the applicant appeared to have totally disregarded permit conditions. It is not known what further actions will be taken

TABLE 15. VIOLATION AND ILLEGAL ACTIVITY STATISTICS FOR THE CHARLESTON DISTRICT COE, FY 1977 - FY 1981 (404 and 10/404 permits)

	FY 77	FY 78	FY 79	FY 80	FY 81	AVERAGE
New violations and illegal activities reported	135	133	160	180	165	155
Number of violations and illegal activity acted on†	90	172	180	157	166	153
(% of total 404 and 10/404 permits)	96%	74%	82%	72%	73%	
Number of after-the-fact permits issued	5	32	21	21	49	26
(% of violations acted on)	6%	19%	12%	13%	30%	
Number of violations and illegal activities litigated	2	3	16	16	23	12
(% of violations acted on)	2%	2%	9%	10%	14%	7%
Number of violations where no permit was necessary	83	129	147	119	194	134
(% of violations acted on) (voluntary restoration)	92%	75%	82%	76%	?	

†Number of violations acted on = new violations + violations pending from last year - violations pending for next year.

Source: (Charleston District COE; 1977, 1978, 1979, 1980, 1981a.)

on these cases.

For 1978, NMFS estimated that known illegal activities in South Carolina destroyed about 8 acres of wetlands. This included .22 acres of *Spartina alterniflora* filled, .16 acres of water less than 5 feet deep filled, 5.82 acres of wooded swamp filled, and 1.28 acres of wetland areas dredged.

Generally, enforcement is not pursued through legal action. Unlike the Wilmington District COE, the Charleston District COE has little contact with the U.S. District Attorney's Office. Restitution usually consists of restoration and occasionally restoration and fines. Rarely are fines alone applied. Those that have been imposed ranged from $500 and $7500. The courts are generally reluctant to impose fines if restoration is possible (Gould, pers. comm., 1982).

(d) Overall COE regulatory program evaluation

The Wilmington District COE has developed a general reputation as being one of the more innovative and progressive districts with respect to wetlands protection. Opinions regarding the Charleston District's current program, however, are diverse and often conflicting. Staff organization is considerably different in the two districts, and this results in differing approaches to the 404 program. The Charleston District has been characterized as conservative in its approach to environmental protection. Its opponents have described it as "among the worst in the Southeast" (Hall et al., 1982). However, others believe that the Charleston District's regulatory program has improved steadily in the last five years (Marshall, pers. comm., 1982). Despite possible program differences, both the Wilmington District and the Charleston District face similar problems. Therefore, the two districts will be evaluated together here in the context of several proposed regulatory reforms. Issues common to both districts include: reducing uncertainty and delay, giving the states more responsibility, reducing overlap, expanding the use of general permits, and clarifying the scope of the permit program.

(1) Reducing uncertainty and delay - A concern expressed by nearly all those contacted involves uncertainties in the 404 program. Problems in defining jurisdiction, exemptions, Best Management Practices (BMPs), and legislative intent have contributed to this uncertainty. First, although the Corps' jurisdiction extends to all "waters of the United States, their tributaries, and adjacent wetlands," the Corps does not require individual permits in waters where the average annual flow rate is measured to be less than 5 cubic feet per second (cfs), since activities in these areas are covered by a nationwide permit (33 C.F.R. §323.4-2). The 5 cfs point is determined from USGS isobar maps which show average discharge, low flow sites, and selected continuous record stations in North Carolina. The maps note average annual discharge rate per square mile. A topography map is planimetered to find square mileage of the drainage basin in question. On the North Carolina coast, average annual discharge rate is typically 1 cubic foot per square mile. Therefore, if a drainage basin has more than 5 square miles, the basin falls under 404 program jurisdiction. The 5 cfs point, however, can be artificially changed by diverting stream flow. Thus, in some areas it may be difficult to determine whether the permit applies. This topic has been more of an issue in North Carolina than in South Carolina because large acreages of wetland in North Carolina are found in flat, inland areas with less than 5 cfs flow. A current case, that of Prulean Farms in Dare County, North Carolina, illustrates this problem and is discussed in Section VI.

Jurisdictional problems also arise with the definition of "fill" on farmland. A farmer conceivably can clear a wetland area, bank the remains into windrows, burn them, and then break them out on the field; since a fill is not created no permit will be needed. Although windrows are piles of debris and in some sense therefore a "fill," the purpose of the windrow is not to change the land elevation and it is not therefore a "fill" under COE regulatory definitions. Yet, such activity can change completely the character of a wetland area. Usually such cases require a 404 permit prior to clearing because necessary drainage involves the construction of canals and/or ditches and subsequent discharge of material from that construction. However, at Smyrna Farms in North Carolina, harvesting and windrowing altered 300 to 400 acres of wetlands without a permit being required. In this case, the crops could be planted in the wetland (Wright, pers. comm., 1982). In one Louisiana case, Avoyelles Sportsmen's League, Inc. v. Alexander (1979), a court decision declared that timber harvest did constitute discharge of dredged material (Civil Action 78-1428 U.S. District Court, Western District of Louisiana, Alexandria Division). The case is being appealed and currently no COE district other than the one in Lousisiana where it was litigated is bound by the ruling.

Many other activities involving modification and destruction of wetlands do not involve the discharge of dredged and fill material and therefore do not fall under 404 jurisdiction because the law regulates discharge of dredged or fill material only. For example, excavation of wetlands with discharge of material on high ground does not require a 404 permit. A wetland can be ringed with a canal, the discharge disposed on the high side of the land, and the wetland area drained with a pump without requiring a 404 permit. Similarly, mowing of marshes on a regular basis can result in severe adverse effects, but it requires no permit. Charlie Hollis believes that such incidents point to the need for overall wetlands legislation rather than relying on 404 for wetland protection (Hollis, pers. comm., 1982).

Second, exemptions under 404, both regional and nationwide, need to be more clearly defined. What constitutes "normal" agriculture and "normal" silviculture is an important issue in both North Carolina and South Carolina. The Wilmington District, with the North Carolina Forest Association, has drawn up some draft guidelines for "normal" silviculture. This is particularly important in North Carolina with the increased acreages held by agribusiness and timber companies. Draft guidelines were not available for this report. No similar guidelines have been written for South Carolina although they would likewise help limit uncertainty about what actions are required in which areas (Betts, pers. comm., 1982). The characteristics of "normal agriculture" have never been defined in detail in either state.

Third, Best Management Practices (BMPs) need to be more carefully described and coordinated specifically with the exemptions. Although the Corps in both districts believe that BMPs are generally followed, other agencies believe that they are sometimes ignored. A system in which each exemption has specific required BMPs might reduce uncertainty about what actions are required, thus making enforcement easier.

Fourth, legislative intent of the 404 program is open to interpretation and has contributed to uncertainty. Although Section 404 is basically water quality legislation, and never specifically mentions wetlands, the Corps incorporated wetland permit requirements in their regulations. After the 1975 NRDC v. Galloway court decision, the Corps further changed their regulations to address the wetland issue, even though the court decision did not demand it. Some interest groups feel the Corps overstepped congressional intent in incorporating such stringent wetland regulation into their regulatory program (Parrish and Morgan, 1982). Others would like the program to address all types of wetlands, and thus to be stronger than it now is. The Corps believes that, although Congress did not mandate that their program address wetland regulation, all court decisions relating to the permit process have consistently upheld the approach taken by the Corps (Wright, pers. comm., 1982).

Delays associated with the 404 process have been a problem in the past.

New regulations promulgated July 22, 1982, may change this. Previously, the time required to review permit applications and draft the conditions of the permit has been an important issue in both districts. In FY 1980, both districts found EPA comments, FWS comments, and NMFS comments to be the most important factors in delaying the review process beyond 120 days for permits not needing an EIS. EPA, NMFS and FWS personnel strongly disagree, noting that they have a 30-day time limit on their comments to the Corps (Nicolajsen, pers. comm., 1982). The delays can only occur as a result of problems with permit conditions and not because of the time required to do the actual review (Hardy, pers. comm., 1982). When an EIS is required, the permit review process can take two to three years (Wilmington District, 1981b). Regulatory staff note that although many of the permits delayed beyond 120 days do involve Section 404, many also involve Section 10 and, in such cases, the delay cannot be accurately attributed to one or the other (Wilmington District COE, 1982).

Under the South Carolina Coastal Zone Act (1977) the state must certify all federal permit proposals to guarantee that the proposed activity is consistent with the state coastal management program. If the state determines that the activity is not consistent, the federal permitting agency may not issue a permit until all disagreements have been resolved (U.S. Dept. of Commerce, 1979). U.S. Fish and Wildlife Service staff believes that the Corps relies too heavily on the decisions of state permitting agencies and not enough on the comments of other agencies. They see this as the major source of delay in permitting most projects (Dunn, Gilbert, Dunlap, pers. comm., 1982). The involvement of FWS and NMFS is discussed further in Section V.A.3.(c). The Corps, on the other hand, believes that the time required to reach a decision from other agencies is a major delay and discourages smaller investors from pursuing projects (Charleston District COE, 1981b). Again, NMFS and FWS state that they are allowed only 30 days to reach a decision concerning any permit application. Their permit conditions, but not a delay caused by their agency, may discourage some smaller investors (Hardy, pers. comm., 1982). The Charleston District has urged the elimination of federal agency referral rights for all but the largest projects because they believe this would facilitate timelier decisions and more substantive comments (Charleston District COE, 1982b). The use of a joint public notice in South Carolina has helped to reduce delays.

The Wilmington District has initiated many innovative procedures to reduce delays in permit processing such as joint public notice with the state, joint on-site visits with state and federal agency personnel, use of identical color photography and shared flight reports with the state, bimonthly joint enforcement meetings and coordination with the U.S. Attorney's office.

Both Corps districts believe that the use of general permits significantly reduces processing time while still ensuring good review and protection of national public interest. EPA staff also are in favor of general permits when conditioned to maintain minimal individual and cumulative impact (Nicolajsen, pers. comm., 1982). However, general permits have been criticized by environmental groups in North Carolina and South Carolina for eliminating the normal public interest review and allowing insufficient time to investigate and resolve adverse environmental impacts. Although general permits are further criticized for the costs an applicant incurs in documenting fulfillment of permit criteria (Parish and Morgan, 1982), the Wilmington COE stated that they incorporate permit requirements such that documentation is not necessary. But, North Carolina is the exception rather than the rule in this matter (Wright, pers. comm., 1982).

With respect to delays in processing permits, the Wilmington regulatory staff expressed a concern that the average number of days necessary to issue a permit can be a misleading statistic. Neither district keeps a detailed record of the number of projects allowed under general and nationwide permits. In 1980, the Wilmington staff predicted that in 1981, 50 applications would be avoided due to general nationwide permits and that 300 permit applications would be avoided due to general regional permits. These activities are not calculated into average permit processing time statistics. As general (nationwide and regional) permits are expanded, more projects fall into these categories, leaving only complex projects to require individual permits. The average time to issue an indivudual permit may then increase, since smaller and more quickly permitted projects do not average into the permitting time statistics. One solution would be to record projects accomplished under general permits; however, this is obviously not time-effective for the Corps. The statistic for average time to issue a permit should be used with reservation.

Other changes that both Corps districts believe would have a highly positive impact on the regulatory program include additional manpower and a reduction of NEPA requirements, or acceptance of public interest review in lieu of satisfying NEPA requirements (Wilmington District COE, 1981b; Charleston District COE, 1981b).

(2) Giving the states more authority - In North Carolina, agencies were very cautious in expressing interest in state assumption of part or all of the 404 process. Preston Pate, of the North Carolina Office of Coastal Management, noted that a careful evaluation would be needed before North Carolina could consider assumption of the 404 process. In conjunction with EPA, the state may conduct a feasibility study of such an assumption. Pate believes that among other incentives, the state would need funding assistance and changes in the EPA regulations to simplify assumption procedures and minimize federal oversight. Further, before the state would be able to coordinate such a program, wetland definitions would need to be clarified so that regulatory boundaries could be

more easily determined (N.C. Department of Natural Resources and Community Development [NC NRCD], 1982b).

In South Carolina the Corps regulatory staff believes that the present 404 program has been the major program protecting wetlands within their jurisdiction. The Coastal Council staff believes that in the coastal areas outside of the Corps jurisdiction, its own program has been more effective for several reasons. First, they believe the Coastal Zone Act specifically addresses the problems related to wetland protection and development, whereas Section 404 makes no direct reference to wetlands. Secondly, the Coastal Council must consider actions in a more comprehensive fashion, while the Corps is concerned primarily with the water quality aspects of dredge and fill activities. And finally, although the Corps has stronger regulatory authority in freshwater wetlands than the SCCC, the Council's authority to make consistency determinations has often been instrumental in protecting these wetlands, particularly for projects covered under the Charleston District's general permits (Aichele, pers. comm., 1982). Although jurisdictional differences exist, the state and federal programs are very complementary and there is good cooperation between the agencies.

For South Carolina as a whole, however, it is generally agreed that the existing state mechanisms for protecting wetlands are inadequate. Significant changes in authority, jurisdiction and funding would be necessary before South Carolina could implement an adequate 404 program. Most people contacted believed such changes are unlikely given the current conservative political climate.

Conservation groups were split on the issue of state responsibility. Representatives of the Audubon Society believe the state already has too much responsibility and the federal government should assume even more. However, the director of the Carolina Wetlands Project, a regional program associated with the National Wildlife Federation, believes that with funding to acquire wetlands and clauses giving tax incentives for private land donation to the states, states with strong programs such as North Carolina could handle the 404 program (Carter, pers. comm., 1982).

(3) Reducing overlapping programs and policies - In North Carolina jurisdictional overlap occurs between lands regulated by the 404 program and those regulated by the state Dredge and Fill Act or the Coastal Area Management Act. But, this overlap does not carry over to programs and policies. The permit applicant can fill out a joint application form for all agencies, and a state permit fulfills the requirements for a COE general permit, easing that burden.

In South Carolina, direct regulatory overlap between state and federal wetland programs occurs with the Corps and the Coastal Council in tidal salt marshes, and with the Water Resources Commission in any lands below the mean high water mark in both tidal and nontidal waters. Indirect overlap exists where several state and federal agencies must comment on or certify individual permits given by other agencies.

Development interests would prefer to have this overlap eliminated in order to limit delays and avoid confusion about where regulatory responsibilities lie. They would prefer to have a single agency responsible for all development permits. Conservationists believe that the overlap provides an effective system of checks and balances among state and federal agency activities and interests (Watkins, pers. comm., 1982).

(4) Expanding use of general permits - The use of general permits is supported by the Corps, EPA, and by industry, as they help reduce the COE regulatory staff workload and the delays associated with the review process. Conservation groups, fish and wildlife agencies, and the South Carolina Coastal Council tend to be opposed to some general permits because they do not allow for adequate

consideration of environmental impacts, they limit other agency comment and public interest review, and they may lead to cumulative loss of wetland habitat to small-scale development.

Concerns were raised in both states with respect to the expansion of general permits. Conservation groups felt that cumulative impacts are not adequately addressed and that general permits give no opportunity for mitigative measures to be required. They favor a "kick-out" clause, existing in one North Carolina general permit (Appendix E), which allows a federal agency to require a 404 permit of an objectionable project.

Currently, the Wilmington District is considering a proposed permit for the "discharge of dredged or fill material resulting from construction of drainage systems, the clearing of land, and other work necessary for the purpose of converting certain lands to agricultural use." It would apply only to activities in seven counties. Reaction to the proposal seems mixed but generally positive. According to Charles Hollis, Chief of the Regulatory Functions Branch of the Wilmington District, the permit will state 10 to 12 conditions that must be met to fall under the permit category. These conditions have not yet been chosen. Hollis believes a landowner would then know clearly the rules and trade-offs necessary for such a land use. The permit allows the COE to "regulate by exception", i.e. require an individual permit where an applicant cannot meet the conditions of the general permit. From a landowner's perspective, it is more desirable to meet the general permit requirements than to undergo the public interest review and associated delay of an individual permit. Hollis further believes that there is little land remaining in the state that would fit all the conditions of such a permit.

(5) Clarifying the scope of the 404 process - The U.S. Corps' administration is "strongly committed to protecting the nation's important wetlands"; however, the

COE feels it is necessary to "specify which types of wetlands are and are not appropriately covered by the Clean Water Act" (U.S. Army COE, 1982b). To this end, alternatives are being discussed which would clearly define boundaries of wetlands over which the Corps would have jurisdiction.

One alternative would define 404 jurisdictional boundaries via flood frequency levels as delineated for flood insurance programs (Hollis, pers. comm., 1982). EPA staff felt such a method would simplify jurisdictional calls (Nicolajsen, pers. comm., 1982). Other sources noted that Circular 39 definitions, if used by all agencies involved in wetland regulation, would work well in reducing scope uncertainty. It was believed that agencies are now accustomed to using these definitions and that further changes only complicate the issue unnecessarily (Barnes, pers. comm., 1982; Parmer, pers. comm., 1982).

Conservation groups in South Carolina generally feel that coastal marshes are well protected, but they are concerned about inland areas and areas beyond the Corps' jurisdiction where state protection is minimal or absent. For example, several agencies have noted this problem with bottomland hardwoods, bogs, and Carolina Bays. Although the Coastal Council's jurisdiction is larger than the Corps' in saltwater wetlands extending above the mean high water mark, it is felt that because the Corps' program includes considerations of interstate commerce it should not be restricted.

(6) Other issues - Federal agencies dealing with North Carolina and South Carolina noted a problem with inconsistency between Corps districts. The Wilmington COE is seen by review agencies as doing an excellent job of informing the public what will or will not be permitted in the 404 program (Hardy, pers. comm., 1982). Their staff organization with area coordinators, each responsible for all Corps activities in certain counties, helps in this respect. In the opinion of review agencies, the Wilmington District more adequately addresses the need to regulate destruction of wetland areas, while the focus of the

Charleston District tends to be more strictly on water quality issues.

Review agencies are incorporated into the 404 process differently by the two districts. A large difference exists with respect to pre-application consultations. In North Carolina, review agency staff are invited by the COE to look at every nonroutine permit on a pre-application basis. Agency personnel often go on site with COE staff (Gantt, pers. comm., 1982). However, South Carolina conducts on-site pre-application consultations with review agency staff in a much smaller percentage of cases (Gould, pers. comm., 1982). National Marine Fisheries personnel make on-site visits by themselves, but they believe a problem results in that the COE is not present as an arbitrator to hear what is said by both parties. The South Carolina COE staff does accompany NMFS staff at the latter's invitation (Hardy, pers. comm., 1982). EPA personnel note that this is much improved in the last year, and that they do presently go on-site with COE staff on a pre-application basis (Marshall, pers. comm., 1982). Charleston District personnel believe joint on-site visits can be confusing to the applicant due to apparent differences in policy. They believe review agency comments should be channeled through the Corps, not the applicant (Gould, pers. comm., 1982).

Handling of large projects or those where review agencies sustain significant objections are facilitated in several ways in the Wilmington District. Since 1972, joint enforcement meetings have been held at least bimonthly among the Corps, state, and review agency personnel. Ostensibly, the purpose is to discuss violation and illegal cases, but agency personnel note that the meeting often offers an open forum for discussion of difficult permit cases as well (Gantt, pers. comm., 1982). Also, in the Wilmington District, large cases with review agency objections often are given a post-application consultation meeting after the public interest review period. Since COE and review agency staff are present with the permit applicant, the COE members can act as arbitrators of any disputes and have full knowledge of any decisions. The Charleston District COE usually sends letters from the review agencies describing their objections to the applicant and recommending that he meet with the agencies to resolve the conflict. Interested federal agencies do attempt to meet jointly with each other and the applicant (Marshall, pers. comm., 1982). However, South Carolina FWS and NMFS staff feel that this does not efficiently resolve the problem, as the results of such meetings can be seen differently by each party when the administrative agency is not present to verify compromises or changed permit conditions. The Charleston COE holds joint post-application meeting in less than 20% of the cases where review agencies sustain objections (Hardy, pers. comm., 1982; Dunn, Gilbert, Dunlap, pers. comm., 1982).

North Carolina COE personnel check 100% of non-routine permits and 40% of all permits issued for compliance. South Carolina COE staff are required to check approximately 10% of all permits for compliance, most of which are nonroutine cases. However, the Charleston District has improved greatly in the last 18 months in its dealing with violations and illegals. Although the Charleston District's aerial surveillance is not as extensive as that in North Carolina, their ability to discover and process violations or illegals is now fair to good (Hardy, pers. comm., 1982). The district's ability to decide on restitution procedures is also good, but the implementation of such decisions is still weak.

All reported violations are checked in both Districts. Where illegal activities are discovered, both the Wilmington and the Charleston COE complete their own in-house investigation of the activity. Where minimal impact of an illegal exists, an after-the-fact permit may be granted. In the past, review agencies felt the Charleston District granted after-the-fact permits for impacts which were not minimal in their opinion, but they feel the Charleston District

COE has improved in this respect in recent years (Hardy, pers. comm., 1982).

The two Corps districts follow somewhat different procedures in cases where Cease and Desist letters are sent. In North Carolina, all reviewing agencies receive a copy of the letter which states to the violator that the COE requests that federal and state agencies visit the site and furnish comments and recommendations to the Corps regarding the alleged violation. The Charleston District does not mail copies of the Cease and Desist letter itself but rather sends correspondence to the agencies describing the site and soliciting comments. Review agency personnel believe that the former more strongly addresses the need for their input (Hardy, pers. comm., 1982).

In one recent comparative case, Carolina Refining and Distributing Company made applications to install petroleum refineries both in Carteret County, North Carolina and in Georgetown, South Carolina. The Wilmington District required an EIS, while the Charleston District decided an EIS was not necessary. Several advocacy groups and federal agencies believe the two proposed refinery sites are very close in character, and that the case demonstrates vividly the different approaches of the two districts and their response to development pressures. However, the respective COE districts as well as the South Atlantic Division Engineer noted differences in the sites and said the two decisions were "consistent based on site-specific conditions" (Bratton, 1980). The North Carolina site was near two marine laboratories and several environmentally sensitive areas. A NMFS employee noted that below the proposed Georgetown refinery site are the Belle Baruch research laboratory, a state wildlife area, and habitat of the endangered short-nosed sturgeon (Cheek, pers. comm., 1982). The Charleston District COE was concerned only with a pipeline through a non-wetland area; a Section 10 review was necessary. Therefore, the Corps is not involved with the proposed refinery in South Carolina as a Section 404 issue (Gould, pers. comm., 1982). The South Carolina Coastal Council also certified the refinery, and the South Carolina Wildlife Federation has filed suit against them for that decision (see Section V.4).

Although review agencies believe the differences in the two districts are substantial, they are generally pleased with the approach of the Wilmington COE and say that the Charleston COE has vastly improved in recent years (Marshall, pers. comm., 1982). Differences in the districts due to staff organization preclude the districts from being entirely consistent in their actions and procedures. A current pilot study in the COE nationally may bear on this issue. The Environmental Assessment Branch of the national Corps believes the regulatory permit program deserves more attention. Two pilot studies in the New Orleans and the Jacksonville districts are therefore looking at a change in the organizational status of the regulatory program designation from "Branch" to "Division." If implemented nationwide, Hollis says such a change could provide a means whereby reorganization of the regulatory program could occur in those districts which desired such restructuring (Hollis, pers. comm., 1982).

Another issue in the two Corps districts concerns the penalties for permit violations. Penalties may consist of fines, restoration, or some combination of the two. In negotiated settlements, the Wilmington Corps generally resolves the violation with both fines and restoration. Fines are assessed based on past violation records and the degree to which restoration is successful. For example, after their fifth violation in two years, Texasgulf Company voluntarily restored 6 1/2 acres in the Pamlico-Albemarle estuary at a cost of approximately $200,000 and a $5000 fine was exacted (Hollis, pers. comm., 1982). The Charleston District noted that they seldom require fines. In both North Carolina and South Carolina, courts have generally been reluctant to impose fines. When the restoration is costly, courts believe that this alone constitutes an adequate penalty.

Several agencies and interest groups believe that fines should be imposed more readily and that restoration alone is not always satisfactory. Their major argument is that in many cases restoration cannot completely replace the original wetland and so should not be considered an adequate penalty. That is, the likelihood and amount of a fine should be great enough that it deters a potential violator from altering the wetland in the first place.

A unique case involved a man-made lake at the Country Club of North Carolina near Southern Pines. Villa Lake Development Company had already cleared approximately 30 acres of bottomland hardwood swamp and partially erected a dam before the violation was reported. In this instance, restoration was so difficult that the developers were open to any other alternative. To avoid litigation, and at the suggestion of the Wilmington COE, the owner of the club purchased a previously unregulated 60-acre Carolina bay, at fair market value, and deeded it to the Nature Conservancy at a bargain price. The COE agreed to take no legal action and then granted an after-the-fact permit. The landowner could then claim a charitable contribution, and the Nature Conservancy purchased a priority site at less than one-third of its value (Herlevick, 1982). Although some lauded this creative resolution of the problem, others in both public agencies and private conservation groups felt the penalty was not appropriate. They point out that no wooded swampland was restored although 30 acres were destroyed. Replacement of one wetland type for another could set dangerous precedent for the loss of one wetland type with certain wildlife habitat values while preserving another with different resource and habitat values.

2. Federal conservation programs

Funds under both the Land and Water Conservation Act and the Migratory Bird Conservation Act can be used to acquire land for endangered species, and natural resource areas for specifically legislated national wildlife refuges and waterfowl habitat. Much of this land, particularly that for waterfowl habitat, would be wetlands. In North Carolina, national wildlife refuges protect a total of 32,582 acres of wetlands. In South Carolina, national wildlife refuges protect a total of 63,110 acres of wetlands. Wetlands may also be protected within areas such as national forests, national seashores, national monuments, national marine sanctuaries, and national wild and scenic rivers. A list of such areas and known wetland acreages in both North Carolina and South Carolina is contained in Appendix F.

Recently, North Carolina began the process of setting up an estuarine sanctuary under the Estuarine Sanctuary Act. Islands and marshes totaling 1,650 acres surrounding Bald Island have been donated to North Carolina as a part of the National Estuarine Sanctuary system in North Carolina. The gift, worth approximately $1,000,000, will be used to match expected federal funds to purchase three other North Carolina barrier islands for the sanctuary. Proposals are currently being written for the matching funds and purchases (Durham Morning Herald, 8 July, 1982). South Carolina has no current or planned estuarine sanctuaries.

3. Policy directives

(a) Executive Order 11990

This policy directive recognizes the national value of wetlands and requires federal agencies to adopt specific policies with respect to wetland protection. The order states that federal executive agencies must, through policy and action, minimize the destruction or degradation of wetlands. They can only construct or provide assistance to construct projects on wetlands where no practical alternative exists and where all measures have been taken to mitigate for wetland harm. Further, federally owned wetlands cannot be leased or sold where the new land use would harm wetlands (Holmes, 1980).

In North Carolina, the Soil Conservation Service dramatically changed their policies and procedures in wetland areas as a result of this directive and others such as the National Environmental Policy Act. Strong mitigative measures are now incorporated in all projects (Farmer, pers. comm., 1982). In South Carolina FWS personnel stated that E.O. 11990 has been important in terms of establishing general policy; it is difficult, however, to point to any cases where wetlands were preserved specifically because of E.O. 11990.

(b) National Environmental Policy Act

If a project requiring a 404 permit is controversial, an EIS may be required due to regulations set forth in the National Environmental Policy Act of 1969 (NEPA). NEPA requires an EIS whenever there is a major federal action that significantly affects envionmental quality, and in this sense, a 404 permit is a federal action. Sometimes a water project exempt from 404 may require an EIS. NEPA may help protect wetlands in these cases because federal water projects such as river and stream channelization for drainage, flood control, navigation and erosion control, disposal of maintenance dredging material and reservoirs fit this category. North Carolina COE representatives deal with approximately five to six EIS cases at any one time, each extending over a two to three year period (Hollis, pers. comm., 1982). Both North Carolina and South Carolina COE districts believe NEPA requirements add substantially to permit processing delays, and would like to see a reduction in NEPA requirements or a public interest review in lieu of the EIS requirement.

(c) Fish and Wildlife Coordination Act

The U.S. Fish and Wildlife Coordination Act (1934 and Amendments) (16 U.S.C. 661-667) requires that the U.S. Fish and Wildlife Service (FWS) and the head of the agency exercising administration over the wildlife resources in the state be consulted on most water and land resource development projects that are federally funded and on all projects that are constructed under a federal permit or license. Similarly, National Marine Fisheries Service personnel would be consulted on cases involving marine fishery resources. Since these agencies have no direct regulatory controls, yet have significant interest in wetland protection, this requirement provides an important mechanism for incorporating fish and wildlife values into the 404 process. Due to limited staff and time available for review, the majority of permits reviewed by these agencies receive no comment.

FWS personnel contacted in both North Carolina and South Carolina believe that the Memoranda of Agreements they have with the Corps of Engineers allow the incorporation of wetland habitat values in projects affecting wetlands. Under the 1982 regulations, the MOA's allow an objectionable permit application to be elevated to one other level for review if the Assistant Secretary of the Army so chooses. Only one permit application has so far been elevated via the MOA in each of the two states.

In South Carolina, FWS field staff felt they were not consulted early enough by the COE regulatory staff for consultations with permit applicants (Dunn, Gilbert, Dunlap, pers. comm., 1982). NMFS staff in North Carolina feel they have a good and open working relationship with the Wilmington District. Joint on-site visits occur with representatives of both agencies present and NMFS personnel are called in for such visits on a pre-application basis. This tends not to be the case in the Charleston District (Hardy, pers. comm., 1982).

Actions taken on 404 and 10/404 public notices by the North Carolina and South Carolina FWS field offices during FY 1981 are shown in Table 16. Actions taken by the NMFS in both states for 1978 and are shown in Table 17.

(d) Endangered Species Act

The Endangered Species Act (1973) is crucial to wetland preservation in two ways. First, it authorizes the FWS to acquire land under several land acquisition authorities. Second, it provides protection to "uniquely productive wetlands determined to be critical habitat for threatened or endangered species"

Table 16: Corps 404 and 10/404 public notices reviewed by FWS field offices in North Carolina and South Carolina from 4/1/80 to 3/31/81.

	Raleigh, NC office	Charleston, SC office
Total requests	240	314
No action	199 (83%)	90 (29%)
No objection	13 (5%)	165 (53%)
Conditional denial	15 (6%)	54 (17%)
Denial	13 (5%)	5 (2%)

Table 17: Corps 404 and 10/404 public notice reviewed by NMFS field offices in North Carolina and South Carolina in 1978.

	North Carolina	South Carolina
Total requests	401	290
No action	337	276
No objection	96 (28%)	42 (15%)
Conditioned or denied (commented on)	241 (72%)	234 (81%)

from federal agency action. Nationally, about 40% of the land so designated is wetland and is thus protected to a greater degree than even by other legislation such as the CWA, Section 12 of P.L. 83-566, NEPA, and Executive Order 11990 (Holmes, 1980). However, no land has been purchased in North Carolina as critical habitat; all such monies have gone to research and education concerning endangered species (Roe, pers. comm., 1982).

(e) Coastal Zone Management Act

The Coastal Zone Management Act of 1972 (P.L. 92-583) is directly responsible for establishing the coastal management programs in both North Carolina and South Carolina. At present, it has the most direct impact on wetland protection through its provisions for funding under Section 306. The budgets in both states rely primarily on federal funds. Section 307 is also particularly significant because it stipulates that the Corps' actions must be consistent with state coastal management plans.

(f) Principles and standards

The principles, standards and procedures for water and related land resources plans and projects (P&S) were adopted September in 1973 by the Water Resources Council and instituted in 1979. They require all federal water projects to consider both structural and nonstructural alternatives in terms of national economic development and environmental quality. A plan without economic benefit may be recommended provided that this deficiency is only due to benefits foregone or additional costs incurred to attain the environmental quality objective. The North Carolina SCS noted that the P&S has been instrumental in changing their policies towards a deeper concern for wetland areas (Farmer, pers. comm., 1982). In March of 1982 the Secretary of the Interior proposed new principles and guidelines (P&G) to replace P&S and "reduce the burden on agencies of complying with detailed, legally binding, technical rules" (National Wetlands Newsletter, 1982b). The proposed rules also remove the environmental quality objective.

(g) Water Bank Program

Neither of the Carolina's is currently involved in the Federal Water Bank Program (16 A.S.C. §§1301-1311 [1976]). Under the program, administered by SCS, private landowners may receive annual payments for conserving and protecting wetlands on their property. To make the program operative in North Carolina, funding must be found. A SCS statewide special study is looking at the feasibility of North Carolina's eligibility for the program. The U.S. Department of Agriculture must designate which North Carolina counties would be eligible to participate in the program and conservation plans must be developed. It may be possible for South Carolina to get funds from the current South Carolina statewide USDA Cooperative River Basin Study. Again, USDA must designate counties in South Carolina eligible for program grants, and conservation plans must be developed.

B. North Carolina

1. Permitting

(a) Coastal Area Management Act permits

The Coastal Area Management Act (CAMA) permit is the most important state permit affecting wetland use. The North Carolina Coastal Area Management Act (NCGS 113-100) was passed in 1974, and CAMA permit requirements went into effect in 1978. State legislation that may affect wetlands in North Carolina is summarized in Appendix I. CAMA designates a two-tier coastal regulatory network covering the 20 coastal counties of North Carolina.

Designated and approved Areas of Environmental Concern (AECs) make up the first tier and receive the most protection. These are designated by the Coastal Resources Commission (described below). Areas of Environmental Concern cover 3% of the coastal zone land area, and designated areas so far include coastal wetlands, estuarine waters, public trust areas, estuarine shoreline, ocean hazard areas, and public water supply areas (Liner, 1980). Coastal wetlands are considered to be those marshes that are subject to regular or occasional flooding by tides. Specified vegetative species are included in the technical definition as indicators of flooding frequency (U.S. Department of Commerce, 1978). Another AEC category, fragile coastal natural resource and cultural resource areas, is designated by the Coastal Resources Commission (CRC) only after public groups nominate them. No AEC's have been designated yet in this category. Projects in an AEC covering more than 20 acres of land or water or more than 60,000 sq. ft. of ground area, or requiring another type of state permit, require a CAMA major development permit. Development in AEC's not needing a major development permit require a minor development permit. About 25% of CAMA permits represent major development and 75% represent minor development (Finger and Jacobs, 1982). Almost 25% of the permits cover residences, 29% are bulkheads, and 23% are pier docks, boathouses, or walkways (Liner, 1980).

Outside of AEC's, but within the 20 coastal counties, any development requiring a state or federal permit of any kind must be consistent with the Coastal Area Management Plan. Federal actions must be consistent with state objectives for the coastal zone due to Section 307 of the Coastal Zone Management Act which requires that all federal actions be consistent with approved coastal management programs. If the state feels an action affecting the coastal zone is not consistent with their plan, a federal license or permit may not be issued. On the state level, CAMA mandated county land use plans for each of the 20 coastal counties and gave municipalities the same option. Local ordinances and regulations affecting land outside AECs are subject to review by the CRC, which is authorized to recommend modifications to the local government (Liner, 1980). Where county and municipality plans exist, state and federal actions must be consistent with both plans.

The act created the Coastal Resources Commission (CRC) to supervise the permitting system, designate AEC's, and issue rules and regulations (Department of Commerce, 1978). The CRC has 15 members, appointed by the governor to staggered four year terms and each representing a particular constituency of coastal interests (i.e., commercial fishing, wildlife or sports fishing, marine ecology, coastal agriculture and forestry, coastal land development, etc.).

CAMA is actually administered by the Office of Coastal Management (OCM) under the Department of Natural Resources and Community Development. OCM is based in Raleigh and has four field offices. Nineteen staff members, 13 in field services, and six in permit processing, consistency review, and regulatory development comprise the regulatory working force. The field personnel perform on-site evaluation, while permit review and coordination takes place in the Raleigh office. OCM actually issues permits, although the CRC can overturn permit decisions where they believe it is appropriate. OCM also administers the Coastal Energy Impact Program for the state and regulates beach access.

Major development permits are administered directly by OCM. For all major permits, applications and on-site evaluations are circulated to all interested federal and state agencies. Major development permits usually require 60 to 65 days to process. From July 1980 to December 1981, OCM processed 335 major development permits, approving over 96% of them. As with COE 404 permits, the state believes the high issuance rate is a result of the large number of pre-application consultations which modify project plans, resulting in the alteration of less wetland area. Of the 13 permits denied, 12 contained objections from 4 other state agencies concerning, for example, wetland impacts on wildlife and marine fisheries resources. CRC overturned none of these denials. In one denial, where an adjacent landowner had filed the only objection, CRC overturned the denial, issuing a permit. Denials may be appealed via the court system, but in North Carolina denial has never been formally litigated. Two cases were appealed to the courts, but one was dropped and the other was settled prior to court (Finger and Jacobs, 1982). In one important court case, Adams v. Department of Natural and Economic Resources (295 NC 683), CAMA's constitutionality was upheld against the claims of several coastal landowners (Finger and Jacobs, 1982).

Minor development permits are administered by local county officials concurrent with other permits such as building, electrical, septic tank, and zoning permits. The counties are reimbursed for inspection of such permits. Minor development permits are issued in an average of only 18 days. From July 1980 to December 1981, 98% of all minor permit applications were approved. All major development projects receive both pre- and post-construction site evaluations. All violations discovered result in enforcement actions requiring at least site restoration and a civil penalty from $100 to $1000.

Although CAMA requires permits for most types of development, the word "development" is defined in the act to exempt "use of any land for the purpose of planting, growing, or harvesting plants, crops, trees, or other agricultural or forestry products . . . except where excavation or filling affecting estuarine waters or navigable waters is involved." (N.C. General Statutes § 113A-102[5][b][4][19][1978]). Further, utilities and railroads are exempt from requiring permits for ordinary upgrading and maintenance (NCGS § 113A-103 [5][b][2][1978]).

(b) Other state permits

In 1978, the state legislature merged the CAMA with a previous state dredge and fill statute and combined their staffs (National Wetlands Newsletter, 1982). Hence, the OCM also administers the Dredge and Fill Act including permits to regulate any "excavation or filling begun in any estuarine waters, tidelands, marshlands or state-owned lakes" (NCGS 113-229). This process involves complete overlap with CAMA jurisdiction in all but state-owned lakes and major tributary upstream areas which are outside the coastal counties but under the State Dredge and Fill Act jurisdiction. The Dredge and Fill Act has no silvicultural exemptions. However, few applications emanate from this law.

To combat the problem of overlap, and to coordinate the coastal zone permitting system, the CRC developed a joint application form covering not only CAMA and state dredge and fill permits, but also the state 401 (Section 401 of the CWA) water quality certification, Section 404 COE permits, and Department of Administration permits for easements to fill submerged state-owned lands. Other state permits may still be required such as Division of Environmental Management water and sewer permits and Division of Health Services public water supply permits. If, after review, OCM issues a permit from this joint application form, the case would be eligible for the COE general permit described earlier, further streamlining the process (Schecter, pers. comm., 1982).

Other permits applicable to wetland regulation are those given by the Division of Land Resources. These include mining permits, dam safety permits, and approval of sedimentation control plans.

All permits in the coastal counties are reviewed by numerous state agencies. Within the Department of Natural Resources and Community Development, the Division of Marine Fisheries, the Division of Forest Resources, the Division of Parks and Recreation's Natural Heritage Program, the Office of Water Resources, and the Division of Soil and Water Conservation review permits. Also, review is done by the Wildlife Resources Commission. The OCM coordinates these responses and has the responsibility to commensurate any discrepancies in the responses (Parker, pers. comm., 1982).

In areas outside of the 20 coastal counties, no state wetland permitting is done except in open water areas as indicated for 113-229 of the Dredge and Fill Act. Only Section 404 regulates wetlands in these areas. The same state agencies comment on 404 permit applications, and the OCM coordinates these to facilitate the review process. Review of A-95 projects is done by the Division of Planning and Assessment within the Department of Natural Resources and Community Development (Schecter, pers. comm., 1982).

2. State-owned lands

State forests, state parks, and gamelands provide protection to many wetlands. Total acreage of wetlands protected by the state was unavailable. A list of these lands is given in Appendix C and includes known wetland information for protected lands. In addition, North Carolina's Natural Heritage Program "registers" private lands, thereby affording some measure of protection. A summary of the program is contained in the privately owned lands section below.

3. Privately owned lands

North Carolina's Natural Heritage Program helps to protect some wetland acreage in the state. The program was established in 1976 by the North Carolina Department of Natural Resources and Community Development (NRCD) to identify areas of "prime ecological significance" in order to preserve the natural diversity of the state (NRCD, undated). The program focuses on the high quality and unique characteristics of natural environments (Roe, pers. comm., 1982).

An inventory of special natural areas in the state has been developed and a list of high priority areas needing protection is compiled annually. At present, 450 areas are noted as protected or needing protection. Of these, 110 natural areas are formally protected or "registered." Registry is a "non-binding, non-regulatory program [which] recognizes landowners for being good conservationists and awards certificates in appreciation of their stewardship. An eligible natural area is entered on the registry only after the owner voluntarily agrees to its designation" (NRCD, undated).

Registered areas include approximately 29,430 acres of wetland in private ownership and approximately 52,940 acres of wetlands in public ownership (Roe, pers. comm., 1982). Most of the wetlands inventoried as natural areas are freshwater wetlands because the Heritage Program believes they are not as well protected by the law as are coastal wetlands. The wetland types considered to be the top priority by the Heritage Program are Carolina Bays and bottomland swamps. Other areas of concern are pocosins in the northeast part of the state, specifically Dare County, and peat bogs in fresh water mountain systems.

Since owners of a registered area can break their pledge at any time, the program's strength is limited. Also, the program's effectiveness is dependent on developers, planners, and government officials to use the inventory for land management decisions. The program is further limited by factors such as lack of funding and staff, lack of interest on the part of the state, and absence of any law or policy protecting the registry. The latter in particular has made the North Carolina Heritage Program less effective than that of other states such as South Carolina (Section VI.C.(2)) (Roe, pers. comm., 1982).

The North Carolina Natural Heritage Program works hand in hand with the Nature Conservancy, "a national nonprofit organization dedicated to the preservation of ecologically significant land" (NRCD, undated). The two top priority wetlands for the Nature Conservancy are Carolina Bays and bottomland hardwoods of the Roanoke River system. The Nature Conservancy helps the state acquire land that is suitable for inclusion in the Natural Heritage Program. However, the Nature Conservancy's effectiveness is weakened by the state's current budget constraints and consequent inability to purchase lands (Roe, pers. comm., 1982). Since the Conservancy is not currently able to pass many lands on to other agencies, they have been forced to decrease their land acquisition program. However, they are now beginning to manage their own lands more extensively. At present, the Nature Conservancy owns 28,000 acres of land in North Carolina (Hatley, pers. comm., 1982).

The Audubon Society is also active in acquiring and managing wetlands in

North Carolina and South Carolina, and owns approximately 11,000 acres of wetlands in both states (Blakeney, pers. comm., 1982).

4. State policy directives

The Governor's Executive Order Number 15 has some bearing on state wetland goals. It purposes to integrate the many parts of the Coastal Management Program and it ensures that preexisting statutes, state guidelines for CAMA, and local land use plans will be consistent with the goals and policies of the Coastal Management Program.

To evaluate the many pressures on coastal resources, the governor has also created a Task Force on Coastal Water Management in North Carolina. The Task Force has identified the four main user groups of coastal resources as agriculture, forestry, marine fisheries, and wildlife, and considers ways that each can develop the coastal zone as they wish with the least environmental impact on the other three groups.

The Task Force has begun recommendations to the governor, and each group has named their major concern. The agriculture sector feels that for small towns to survive, there must be a water management program. Specifically, farmers must be able to remove up to 2 inches of water in a 24 hour period to get high productivity levels. Forestry representatives note that drainage is vital to two periods of operation, during harvest for trafficability for machinery without land drainage and during reforestation to optimize growth. Marine fisheries task force members say freshwater intrusion into primary nursery areas is their single biggest problem. Some 70,000 acres of primary nursery area have been identified along North Carolina coasts and, unfortunately, the time of year most crucial to protection of these areas is also when the farmers need optimum drainage. Wildlife representatives say the change in habitat diversity is critical. Such changes enhance some species while hurting others. These needs will be incorporated into policy recommendations to be delivered to the governor by October 1, 1982.

5. North Carolina program evaluation

Several studies have examined the effectiveness of the CAMA program. Liner (1980) concluded that CAMA had not restricted the ability of landowners to use their land. Cama prohibited development in two out of 191 minor permit cases in ocean hazard AEC's of seven selected beach communities. In at least one of the two cases, local ordinances also would not have allowed the proposed development to occur (Liner, 1980). Since owners are generally not restricted from developing their land, Liner found no "widespread inequity or unfairness" resulting from state wetland regulation.

An Urban Institute study (1978) examined permit compliance and found that work done on 54% of all permits issued was in compliance with all permit conditions. This average compared favorably with the other states included in the study - Maryland, Rhode Island, and Florida. In 1978, 18% of those surveyed for the North Carolina study believed permitting time was reasonable and 39% believed it unreasonable. Most of those surveyed felt there was a high risk of detection for failure to comply with the law (Urban Institute, 1978). Seventy illegals were examined and consisted of 41% bulkhead or seawall construction, 20% dock or pier construction, and 14% illegal dredging and spoil placement. From the violation records, it appeared these accounted for an average of 1 to 5 acres of wetland loss (Urban Institute, 1978).

In comparing the stringency of the various state wetland statutes enacted prior to 1978, North Carolina's program ranked particularly high in several categories such as compliance inspection, and prosecutorial cooperation (Rosenbaum, 1978).

State and federal agencies seemed to be generally pleased with the OCM regulation of coastal wetlands. Concern was expressed about state assumption of the 404 process (see V.A.(1)(d)), exemptions, unprotected wetland types, and mitigative measures.

Exemptions

Conservation groups believe exemptions are a particular problem because agriculture and forestry have such a significant impact in the state. Yet, strong political lobbies have kept these activities fairly free from regulation in both COE and state programs (Heath, 1981). Derb Carter, Director of Carolina Wetlands Project, an organization which promotes public participation in the 404 process, believes that "as many acres of wetlands are lost to agri-business due to exemptions, general permits, and regulations as exist as coastal salt-marsh" and are protected under CAMA (Carter, pers. comm., 1982). Hence, Carter believes the net policy effect is zero.

Unprotected wetland types

Several wetland types are unprotected in the state. Pocosins, in particular, do not fall under Corps jurisdiction because they are generally isolated, and are seldom regulated by the state as AECs. Pocosins provide particularly good land for crops and are drainable for pine monoculture. Both forestry and agriculture are exempt to some degree by both Section 404 and CAMA, and these wetlands are being extensively modified. Also, Carolina Wetlands Project staff believe that extensive wetland acreages exist above the 5 cfs headwater designation due to the states' flat coastal plain, and that therefore, the 5 cfs cut-off point does not limit wetland development effectively (Carter, pers. comm., 1982).

Mitigative measures

Some agencies believe that mitigative measures prescribed by state and federal permits are generally reasonable, but can be harsh and inconsiderate of economic factors at times. In one case, NMFS comments caused the North Carolina Department of Transportation to face a cost increase of $2.2 million for the Cape Fear River bridge to preserve 1 1/2 acres of wetlands. However, the department has never had a permit denied and rapport is noted to be good with the COE, EPA, FWS, and OCM (Edgerton, pers. comm., 1982). Further, COE personnel noted that this amount was an extreme example and that had the mitigation not been accepted, the project would probably not have received a permit (Wright, pers. comm., 1982). As CAMA has evolved since 1978, it has facilitated problem resolution. Recently in New Hanover County, North Carolina, the local land use plan came under close scrutiny. Some residents wanted an area of undeveloped marshland to remain classified at "rural-density" levels, while developers wanted the classification changed to "developed". Environmental and economic values clashed heatedly. CAMA provides for a public-decision making process which in this case resulted in the avoidance of a court battle. The marshland remained classified as "rural-density", but water and sewer service was permitted - a service usually reserved for land classified as "developed". Such compromised classifications are allowed in the CRC land use guidelines (Finger and Jacobs, 1982).

C. South Carolina

1. Permitting

State permits for development activities affecting wetlands may be required from the South Carolina Coastal Council, the State Budget and Control Board, or the Department of Health and Environmental Control. South Carolina state legislation that may affect wetlands is summarized in Appendix J.

(a) Coastal Council

The South Carolina Coastal Zone Act of 1977 (SC Gen. Statutes §48-39), established the South Carolina Coastal Council (SCCC) as the agency responsible for devising policies to protect, restore, and enhance the State's coastal resource. The goal of the coastal management program in South Carolina is to "achieve a rational balance between economic development and environmental conservation of natural resources in the coastal zone" (U.S. Department of Commerce, 1979). Specific policies and definitions to be used by the Council in evaluating projects affecting wetlands are numerous and set forth in the program document. In general however, projects that would require fill or other significant permanent alteration of a productive marsh will not be approved "unless no feasible alternative exists or an overriding public interest can be demonstrated and any substantial environmental impact can be minimized" (U.S. Department of Commerce, 1979).

The Council consists of 18 members appointed by the governor and is backed by a technical and legal staff of 26. The staff is responsible for administering coastal development permits. Although the Council actually issues the permit, they usually act on the recommendation of the staff (Aichele, pers. comm., 1982).

Permits are required for any alterations occurring within areas defined as "critical areas" under the Coastal Zone Act. These areas are beaches, primary ocean-front sand dunes, coastal waters, and tidelands. Tidelands are defined as:

> "...all areas which are at or below mean high tide and coastal wetlands, mudflats, and similar areas that are contiguous or adjacent to coastal waters and are an integral part of the estuarine systems involved. Coastal wetlands include marshes, mudflats, and shallows and means those areas periodically inundated by saline waters whether or not the saline waters reach the area naturally or through artificial water courses and those areas that are normally characterized by the prevalence of saline water vegetation capable of growth and reproduction."
>
> (U.S. Department of Commerce, 1979)

Individual permits are required for all major and most minor activities in these critical areas. A general permit has been issued for certain minor activities such as the construction of private docks and piers. Permitting usually requires three months, though large projects can require up to several years if major conflicts are involved. The Council is also responsible for reviewing and certifying all federal permit applications for projects occurring in the coastal zone but outside of critical areas. The certification denotes that a project's impacts are consistent with preservation of the state's coastal resources. This consistency determination specifically includes all activities in freshwater coastal wetlands.

Approximately 95% of the permits granted by the SCCC are for docks, piers, and other minor construction, and do not involve wetland destruction (Table 18). Less than one half of one percent - less than 100 acres in all - of the total wetland acreage in "critical areas" has been lost since 1977, mainly to large, water-dependent projects such as shipyards and ports. However, even with these projects, the Corps and the SCCC are now requiring two to one mitigation so that more wetlands are actually created than are destroyed. For example, the new Wando Terminal in Charleston will create 20 to 30 acres of marsh in cooperation with the USFWS and the SCWMR. The largest recent loss resulted from an approved permit to redike 660 acres of marsh near the mouth of the Santee River (Aichele, pers. comm., 1982).

b. Budget and Control Board Permit

Outside of the critical areas, a State Budget and Control Board navigable water construction permit is required for any construction, alteration, dredging, filling, or other activity involving:

> (a) any land below the mean high water line in tidally influenced areas,
> (b) any submerged lands in tidally influenced areas, or
> (c) any land below the ordinary high water mark of any nontidal navigable waterway.
>
> (SC §R19-100)

The South Carolina Water Resources Commission is responsible for administering these permits. Regulations were passed in 1975 that define the State's jurisdiction and establish procedures for administering navigable water construction permits. Section 19-506 of these regulations reads:

> Within the reasonable capabilities of the reviewing agency, the

Table 18: Statistics on permit review activity by the South Carolina Coastal Council for 10/1/81 to 3/31/82 (Aichele, pers. comm., 1982).

Permits for development in Critical Areas:

permits issued without provisions	44
permits issued with provisions	80
permits denied	2
still active	68
other	1
total	195

major activities	44
minor activities under general permit	80
minor activities	63
total	195

Consistency determinations:

Federal other than A95	9
A-95	70
DHEC	128
NPDES	30
mining	34
well	8
air	13
sanitary landfill	1
total	363

2. State owned lands

State parks, forests, and game management areas provide protection to wetlands. Total acreage of wetlands protected by these areas was not available. However, a list of state owned lands is provided in Appendix H with information regarding wetlands indicated in many cases. The South Carolina Heritage Trust Program, in particular, provides important protection to natural areas, including wetlands.

The South Carolina Heritage Trust Program was begun in 1976 as a joint program between the Nature Conservancy and the State. The program is designed to inventory, evaluate, and protect the state's cultural and natural heritage (S.C. Wildlife and Marine Resources, undated). The program provides legal protection for properties but does not necessarily provide for their management. Funding for the Heritage Trust program is provided by private sources and state agencies, and by the U.S. Department of Interior's Land and Water Conservation Fund (Nature Conservancy, undated).

The Heritage Trust Program offers three levels of protection to lands. Areas of special interest may become Heritage Preserves, part of the Heritage Trust, or simply registered with the Heritage Trust program. Each of these provides a different degree of protection for a natural area.

For an area to become a Heritage Preserve, transfer of the full title of the land to the state by purchase or donation, or the transfer of conservation easements to the state is required. Under dedication as a Preserve, some activities on the land are prohibited or restricted. Regulations are enforced by the state if full title has been given or by the landowner in cases of conservation easements. The Heritage Trust Program currently has 5 Preserves protecting approximately 23,500 acres. Of this total, 13,728 acres are shallow impoundments and marsh, 100 acres are wet depressions, and 30 acres are stream and adjacent floodplain (Sorrow, pers. comm., 1982).

A Heritage Preserve may be further protected by conveying it to the

Heritage Trust (S.C. Wildlife and Marine Resources, undated). This is a legal trust in which the South Carolina Wildlife and Marine Resources Commission is the trustee and the beneficiaries are the citizens of the State. To allow any development on a Trust area, there must be no reasonable alternative. There is no greater protection available than a Trust (Rayner, pers. comm., 1982).

Registration of land with the Heritage Trust Program is less binding than the first two options. It involves a gentleman's agreement between South Carolina Wildlife and Marine Resources Department (SCWMR) and the landowner in which both parties agree to protect the area's features of significance. The registration is voluntary and such arrangement is undertaken only after purchase, donation, or easement options have been pursued. Fifteen natural areas totalling approximately 4629 acres, are currently registered with the South Carolina Heritage Trust Program.

The South Carolina Heritage Program has been effective in protecting those wetland areas that it has been able to acquire. However, because the program is hampered by lack of funds and a small staff, the acquisition of special interest areas must be curtailed (Rayner, pers. comm., 1982).

3. Privately owned lands

Particularly in the coastal area, many South Carolina wetlands are preserved in private ownership. Hunting clubs preserve and manage wetlands for waterfowl and other wildlife, and many large, old family plantations include extensive wetland areas that have been preserved by the owners. Of particular importance are wetlands owned and managed by private conservation groups. These include: Four Hole Swamp, a 3,659 acre tract of virgin tupelo-cypress swamp owned by the National Audubon Society, and Congaree River Floodplain Forest, 12,000 acres of bottomland hardwood owned by the Santee River Cypress Lumber Company. The latter tract has been designated as a national monument The Nature Conservancy has been active in acquiring lands for the Heritage

Program, though this is currently not emphasized because the State is less willing to buy these areas, often due to budget constraints. Other groups, such as the Sierra Club, the South Carolina Wildlife Federation, and the South Carolina League of Women Voters do not own wetlands but are very active in advocating their preservation (Watkins, pers. comm., 1982; Spence, pers. comm., 1982).

4. Program evaluation

The Coastal Council feels that all coastal wetlands are adequately protected, primarily by the state coastal management program. Some problems have been encountered in coordinating CZM program expertise with local government programs and with other state agencies for freshwater wetlands, but in general, no problems are faced in saltwater wetlands. The Council believes there is essentially no regulation of wetlands beyond the coastal zone at the state level (S.C. Coastal Council, 1982a). Criticisms of the overall effectiveness of state permitting programs protecting wetlands tend to center on three issues: limited jurisdiction, ambiguous terminology and definitions, and susceptibility to political pressures.

Limited Jurisdiction. In the coastal zone, the state has direct permitting control only in the critical areas. Although the Coastal Council has generally been effective in monitoring activities outside the critical areas, many in conservation agencies and groups believe that the entire coastal zone should be considered a "critical area", and that without the Corps 404 program there would be minimal protection afforded to coastal freshwater wetlands. Special consideration is given under CZM to "Geographic Areas of Concern", which are defined as areas having unique or particularly vulnerable natural, recreational, aesthetic, historical, or cultural value. It is believed however, that many areas requiring such designation, have not been named "Geographic Areas of Concern" (e.g. Port Royal Sound and St. Helena Sound). It is felt that the

Water Resources Commission's jurisdiction is very limited and does not include many important inland wetlands, particularly bottomland hardwoods and Carolina Bays. The state's ability to regulate small projects such as single-family residential development, is limited and therefore the issue of cumulative impacts may not be adequately addressed.

Terminology and Definitions. One of the most frequent criticisms of South Carolina's wetland protection programs is the ambiguity and general nature of several state policies and guidelines. The Coastal Zone program in particular contains terminology that can be confusing to developers and alarming to protectionists. For example, terms such as "significant," "feasible," and "should consider" can leave considerable discretion to the Council. Much of this phrasing was intentional in order to allow flexibility and to recognize the need to balance development and preservation. A response in the 1979 Program EIS review to a statement regarding forestry development reads: "All the policies... are sufficiently flexible for the applicant to demonstrate special constraints or conditions for specific project proposals." Statements such as this emphasize that the intent of CZA is not to prevent development, but rather to guide it.

Sometimes technical data does not exist or cannot be obtained without costly sampling or research. Thus some agency decisions must be based on subjective analyses. In such instances, conservationists believe the policy may be interpreted too narrowly, with development interest prevailing. On the other hand, developers believe it will be interpreted too broadly, preventing activity in areas that are not critical. Both interests urge for more definitive language, though for different reasons.

Criticism has been lodged also at the policies of other agencies' simply because they do not address wetland issues directly even though they administer programs that affect them. For example, the State Budget and Control Board permitting of construction in navigable waters has been used as a wetlands protection tool even though no explicit mention is made of wetlands.

Political pressures. The susceptibility of state agencies to political pressure is related to the problem of the flexibility of agency policies. The members of the Coastal Council and the Budget and Control Board serve on a part-time basis only and are generally people without expertise in the environmental sciences. They are exposed to a wide variety of sectarian interests as well as sometimes conflicting public interests, for example those represented by the State Development Board, the Forestry Commission, and the Department of Transportation. Pressures for development are very strong in a state where unemployment rates approach 20% in some coastal counties.

The South Carolina Wildlife Federation has recently filed a suit against the SCCC for a decision to certify a proposed oil refinery at Georgetown, South Carolina. Both federal and state wildlife agencies have voted to oppose the refinery, fearing that it would damage the fisheries and sensitive environmental areas of the Sampit River and Winyah Bay (Durham Morning Herald, 1982). The Sierra Club believes that powerful political interests, however, have influenced the SCCC and the Charleston COE in their approval of the project (Watkins, pers. comm., 1982, Spence, pers. comm., 1982).

The permitting by the SCCC of a project altering 660 acres of marsh on the Santee River is also believed to be politically motivated, and is being challenged by the Natural Resources Defense Council, the South Carolina League of Women Voters and the state Attorney General (Hall et al., 1982; Hardy, pers. comm., 1982).

In many other cases involving smaller areas of wetlands, the SCCC has issued permits allowing the dredging and filling of wetlands despite recommendations for denial from the SCWMR, NMFS, USFWS and EPA. Where a federal permit has been denied for the same or similar type of project, the result has been confusion on the part of the applicants about what permit requirements really are (Hardy, pers. comm., 1982). The South Carolina Wildlife Federation and other environmental groups feels that the SCCC betrays a pro-development bias by not acting consistently with the intent of the Coastal Management Act.

VI. Case Studies

The example cases in this presentation are chosen to give concrete examples of the effects of legislation on wetland development, and to describe some projects and techniques which could be helpful in future studies of development in wetland areas. The Hilton Head Island case shows the use of a Special Area Management Plan in the regulation of wetland development. The Prulean Farms case illustrates problems faced by large agricultural enterprises with respect to wetland development in coastal North Carolina. The Albemarle-Pamlico Peninsula example case describes the Atlas Project in addition to phosphate and peat mining operations in the area. The LRIS case discusses a unique program of computer resource mapping which has the potential to provide accessible data on wetland areas throughout the United States.

A. Hilton Head Island

In order to preserve the unique barrier island environment of Hilton Head, the South Carolina Coastal Council has developed a Special Area Management Plan for the island. Other agencies such as the SCWMR and the USFWS have only been incidentally involved in the development of this plan (Dunlap, pers. comm., 1982, Dunn, pers. comm., 1982). The document has been prepared to facilitate the regulation of development activities on the island, and maintain island wetlands in their natural state. This type of management plan is relatively unique in the state, although the SCCC hopes to complete more in the future (Aichele, pers. comm., 1982).

The Coastal Council uses the policy provided in the management plan in the review of permit applications for any development activities on Hilton Head

Island. The policies are applicable only to "new projects or the expansion and significant alteration of existing projects and activities" (SCCC, 1982b). The document is available to developers who are encouraged to review it and consult the Coastal Council staff to acquaint themselves with the regulations and policies of the agency before attempting any development activities. This process decreases the number and severity of many of the problems encountered in permit applications.

A summary of existing policy, rules, regulations and "State of the Arts" findings are described in the management plan, for each of the following subjects: water quality, tidal wetlands, freshwater wetlands, beaches and dunes, public access and cultural resources. Issues of concern are detailed and new SCCC policies are outlined for each subject.

Tidal wetlands on Hilton Head Island are stressed by development activities such as dredging, filling and the disposal of spoil in wetland areas. Water access facilities, particularly the lock/basin type of marina are currently of concern (Aichele, pers. comm., 1982). This type of marina has become popular because of the "scarcity of large tracts of waterfront property and the desire for additional waterfront development sites" (SCCC, 1982b). Construction of the lock/basin marinas, excavated from upland areas and equipped with locks regulating water levels and preventing destruction of boats due to tidal fluctuations, has resulted in "greater access to the water by boaters and home owners accompanied by very serious potential water quality problems" (SCCC, 1982b). Decreased water quality affects wetlands, creeks and shellfish areas surrounding the marinas. The direct impact of marinas on the wetlands is a 1000 feet closure of shellfish grounds in the area. A problem faced by the state is the demand for 10 additional marinas on Hilton Head Island, and theoretically, a maximum of 10,000 feet of closed shellfish beds (SCCC, 1982b).

Stormwater runoff into surface waters is another issue of concern on Hilton

Head Island. Water quality degradation results from the runoff. Increased areas of impervious material such as paved parking lots and roads, requires storm water to travel farther before entering the soil, picking up increasing amounts of contaminants which are then delivered to streams and estuaries (SCCC, 1982b). Tidal wetlands, in particular, are detrimentally affected by this runoff.

To combat such wetland pressures, the SCCC will implement new policies, along with the enforcement of existing rules and regulations, in the review of projects involving tidal wetlands. Development of marsh hummocks as described in the Hilton Head Marsh Hummock Inventory will be discouraged (SCCC, 1982b). The SCCC will enforce regulations restricting access to these areas (Mikell, pers. comm., 1982). Cummulative effects of proposed projects will be examined in more detail. Proposed marinas will be encouraged to relocate, if necessary, to areas where shellfish beds have already been closed, and no project will be approved which could cause the closure of the most productive beds on the island, as identified in the Hilton Head Shellfish Inventory (SCCC, 1982b). Lock/basin marinas will not be approved unless it is shown that water quality degradation will not occur. Significant alterations of the "critical area" (defined by the SCCC as coastal waters, wetlands, beaches and dunes) to create attractive locations for marinas and similar projects will not be allowed (SCCC, 1982b).

Before the implementation of the Special Area Management Plan, development activities on Hilton Head Island resulted in a loss of approximately 33% of the freshwater marshes and an additional 20% had been sigificantly altered (SCCC, 1982b). These wetlands were important as wildlife habitats, receiving areas for stormwater runoff , natural filtering systems for contaminants introduced into wetland areas, and areas for groundwater recharge. The Special Area Management Plan stresses the preservation of those freshwater wetlands, identified and mapped by SCCC staff, that exist in their natural state, and also those that have been only slightly altered.

In addition to those policies already described in the South Carolina Coastal Managment Plan (U.S. Department of Commerce, 1979) - for example, the denial of permits for residential development in freshwater wetland areas when feasible alternatives exist, or the prohibition of projects substantially altering freshwater marshes when other alternatives exist - the South Carolina Coastal Council has outlined two new policies for dealing with development in freshwater marsh areas. Stormwater runoff will be directed into "natural drainage routes and freshwater wetlands, but should not exceed the assimilative capacities of those areas" (SCCC, 1982b). The assimilative capacity, based on physical features of the wetland, is the amount of nutrient-laden water that can pass through a wetland area without damaging that ecosystem. Biologists for the SCCC have been given the task of determining the assimilative capacity of each individual wetland area as it becomes evident that proposed development will affect that wetland (Mikell, pers. comm., 1982). Site visits of freshwater wetlands identified on the island will be conducted. The Corps' 404 designation of freshwater wetlands will be utilized to choose those areas of special interest worthy of protection (SCCC, 1982b).

Although the above program description is very theoretical, the Special Area Management Plan has helped decrease development problems in the Hilton Head area. Developers are made aware of the regulations and are able to modify projects before applications for permits are made.

Apparent opposition to the Special Area Management Plan, even from developers, has been very slight. Hilton Head Island was originally popular because of its clean, pristine atmosphere. The appeal of this image is one of the continuing attractions of the island. Developers must be careful to protect this image while simultaneously promoting development on the island (Robinson, pers. comm., 1982). Conformance to the regulations in the plan may prohibit or restrict developers from altering any wetland landholdings and thereby limit potential development profits. However, it is conformance to the plan that promotes area business.

An example of the results of the management plan is the development of the Gardner Matthews plantation on Hilton Head Island. This area, to be developed by the Hilton Head Company, covers 2000 acres of land. Proposed activities on this land include two 18 hole golf courses, single and multi-family dwellings, an equestrian center and polo field, a civic and cultural center and various commercial areas. Developers have worked at length with the SCCC to insure that SCCC regulations are satisfied.

The golf courses, for example, have been modified to aid in wetland protection at the project design level. Often low lying wetland areas on golf courses are filled to create dry ground. The golf courses at Garner Matthews plantation, however, were designed to incorporate wetland areas, identified from color infrared photographs, as aesthetic additions to the course and as collection areas for water runoff.

Other areas of Hilton Head have been developed in this same manner. When the recommendations of the Coastal Council are heeded in the early stages of the project, the permit application process runs much more smoothly, and the wetland areas on Hilton Head Island are preserved to the greatest extent possible (Johnson, pers. comm., 1982). Wetland areas on Hilton Head Island are also preserved as areas of special interest when Coastal Council recommendations are followed. The advantage of special area management plans is that they provide a precedent, both political and legal, for the protection of all wetlands in a specified plan area.

B. Prulean Farms

Prulean Farms is a joint venture of First Colony Farms in Creswell, North

Carolina and the Prudential Insurance Company. Prulean encompasses 63,000 acres of shrub and forested wetlands, transitional wet soils, and cultivated farmland on the Dare County mainland. Over the next five years, the clearing and development of approximately 22,000 acres of mineral and shallow organic soil for row crop agriculture is proposed (Research Triangle Institute, 1981). The Wilmington COE District has determined that these activities fall under their jurisdiction and will require a Section 404 permit. This project is the first of its kind in the Wilmington District and the outcome of the permit decision will establish a precedent for other large-scale agricultural development in coastal North Carolina. In a broader sense, this case also illustrates the kinds of problems faced by the private sector with respect to wetland regulations.

The agricultural lands of Dare County are among the most productive in North Carolina, yet to bring new areas under cultivation requires investments that are beyond the resources of most local farmers. In a region where unemployment currently exceeds 20%, large, corporate agricultural enterprises like Prulean Farms offer a boost to the local economy while serving the larger public need for productive farmland. Employment for 155 development workers will be provided for the first five or six years and 82 additional farm related jobs in succeeding years. Due to the Prulean Farms operation, the Dare County tax base will increase by approximately $3,000,000 because of the land improvement (Prulean Farms, 1982). The Dare Peninsula also contains extensive undeveloped pocosin wetland habitat and is surrounded by highly productive estuaries, important to North Carolina's fishing industry. The area provides prime habitat for reclusive animals such as the black bear and bobcat, and rare species including the American alligator and the red-cockaded woodpecker.

The large area of wetlands involved, the economic considerations, and the potential impact on habitat, water quality, and fisheries have made this a particularly controversial project. In particular, uncertainty regarding the Corps' jurisdiction in wetlands and delays in resolving conflicts and satisfying regulations has been of concern to all parties involved.

In the spring of 1980, following several site visits and consultation with other federal agencies, the Wilmington Corps notified Prulean Farms that clearing operations on portions of their 63,000 acres might fall under the Corp's 404 jurisdiction and recommended that Prulean halt any further clearing activity in Dare County until specific wetland areas on the property could be delineated. Meanwhile, the clearing and drainage crews continued to work on 5,500 acres, also owned by Prulean, in neighboring Tyrrell County. In August 1980, the Wilmington District determined that no further clearing activities could be conducted on any previously unditched acreage without further study by the Corps and the processing of permit applications. It was agreed that Prulean would apply for permits to complete the drainage and conversion of 1400 acres in Dare and 1600 acres in Tyrrell counties where work had already been started. Prulean also requested the Corps to examine other parcels of land to determine whether or not such areas could be developed without any permits.

In October, 1980 public notice was issued on these applications and a public interest review was initiated. Objections were made by NMFS, FWS, and EPA. In April, 1981 the Corps finally issued a permit allowing for the development of 1,204 acres in Dare County. In the meantime it was also determined that an EIA would be required before any of the land within a 23,300 acre permit area on the Dare Peninsula could be developed. It was also determined that 5200 acres owned by First Colony Farms in Tyrrell County, could be developed without a permit. A draft EIA on Prulean's proposal to convert 22,000 acres in Dare County was completed in February 1982 and the final EIA was published in August 1982.

In the two and a half years since Prulean's original proposals were made, Hobart Truesdell, President of First Colony Farms, estimates that $2,208,000 have been spent on preparing the EIA and mitigating impacts to comply with permitting. This does not include the opportunity cost associated with project delay (Truesdell, pers. comm., 1982). Furthermore, approximately 66 workers have been laid off as a result of the stoppage of clearing operations. Thus, the delay in processing large, controversial projects can impose a considerable financial burden on the applicant and result in economic hardship for the local community.

Environmental groups argue that ample time must be given to allow for an accurate determination of project impacts and to develop the conditions of the permit. They believe that the potential long-term detriment to water quality, wetland habitat, and commercial fisheries outweighs any short-term costs to the investors. Indeed, Truesdell does not disagree in principle, feeling that the review period probably improves the farm's operation in the long-run by avoiding or minimizing adverse future impacts of the project. However, he believes that much of the delay is also caused by inconsistencies and uncertainty within the government agencies themselves, and that the requirements of the 404 program need to be more clearly defined for all concerned. The owners of Prulean Farms' Joint Venture have been particularly frustrated by indecision on the part of the Corps as to the exact extent of 404 jurisdiction.

The large area involved and the diversity of vegetative and soil types in Prulean's holdings has led interested parties to stress the need for a more detailed definition of exactly what wetlands fall under the Corps' jurisdiction. The use of the 5 cfs determination has been a problem in Dare County because stream flows are easily changed or diverted with the already existing network of drainage canals in the area. Using the 5 cfs method, it has not been clear exactly which areas require a permit and which ones do not. Steve Barnes, an agronomist at First Colony Farms, suggests using the standard USFWS Circular 39

Types 1-20 classification and including in those types an evaluation of their relative value for various uses. Such a system, he believes, would enable administrators to distinguish at any given site between those areas that are better left untouched, those that could sustain minimal disturbance, and those that have limited ecological value. Derb Carter and Mike Corcoran, representing the Carolina Wetlands Project, believe that the Corps must decide which wetlands are in the public interest and which ones are not, and that once decided, the public interest must prevail (Carter and Corcoran, pers. comm., 1982). Truesdell likewise feels that private interests cannot compete with the public interest, and therefore stresses the need for clearer definitions.

Once a decision is made regarding the use of an area, the conditions of the permit must be carefully spelled out. At Prulean Farms, there has been discrepancy over the interpretation of "Best Management Practices (BMP's)" and whether certain of these practices will be adequate to protect ecologically sensitive areas. Carter and Corcoran express further concern regarding the enforcement of BMP's and other permit conditions. Large projects such as Prulean Farms will require monitoring over many years, and therefore will rely on a consistent long-term Corps program.

The balancing of costs and benefits also contributes to uncertainty. Although the economic benefits and environmental costs can be determined for the most part, there is no method agreed upon for the comparison of the value of wetlands and the value of agricultural development. The major significance of the proposed Prulean project is that it exemplifies the classic confrontation between developer and protectionist. The specific arguments about endangered species, 5 cfs, best management practices, etc. are simply subsets of more fundamental value related differences. These larger differences must be recognized if there is to be a basis for making reforms in the 404 process. The Corps will always be faced with the problem of enforcing the provisions of the law despite the objections of private interests. However, opponents and promoters of the Prulean Farms proposal both agree that a permit system is needed which clearly defines the goals of the program and the resource to which it applies. They believe these elements are lacking in the current 404 program.

C. The Albemarle-Pamlico Peninsula

The Albemarle-Pamlico peninsula, on the coast of North Carolina, is almost entirely composed of pocosin land, most of which is presently classified as "in transition" (Figure [illegible]). Because of its prime location, the area is subject to heavy development pressures from all of the different industries discussed earlier. Most of the land on this peninsula is owned by First Colony Farms, Prulean Farms, and Weyerhaueser timber company. Some areas are under private and government ownership (McMullen, 1982). Mining industries on the peninsula, many of which are still in experimental stages, produce unusual development pressures.

In North Carolina, the Division of Land Resources in the Department of Natural Resources and Community Development has issued mining permits affecting a total of 20,000 acres to First Colony Farms, Inc, American Peat Company, Inc., Peatco, Inc., and Peat Fuels Inc. on condition that "the permitted mining operation shall not violate standards of air quality, surface water quality, or ground water quality promulgated by the Environment Commission" (Mann, 1982). The First Colony Farms project alone has the option on 15,200 acres of land to be used for peat mining operations, all of which are on the Albemarle-Pamlico peninsula. The project is exempt from any type of permit other than a mining permit. For instance, the mining requires no NPDES permit because decisions have not been made as to whether the mining should be considered a point or non-point source discharge (Roach, 1982). A 404 permit is not needed because the land to be utilized is in the headwaters - stream flow in the area is less than 5 cfs (Hollis, pers. comm., 1982). Finally, the project, as it stands, does not require a CAMA permit unless a pipeline is constructed transporting the methanol to ships through an Area of Environmental Concern. Because of these exemptions, funding for the project is the only deterrent to a full-scale peat mining operation. First Colony Farms has recently applied for, and been denied, a $400,000 to $500,000 grant from Synthetic Fuels Corporation (Synfuels) (Roach, 1982, Carter, pers. comm., 1982). However, a proposal has been resubmitted to Synfuels for consideration next year.

A cost-benefit analysis of the project is controversial. Is the cost of possible damages to the pocosin, fishing industry, air and water quality of less importance than the benefits of using peat as an alternate fuel source? As yet, the full impacts of the mining operations are relatively unknown while an estimated benefit of these operations is 51.3 million gallons of methanol per year (Roach, 1982). If, instead of methanol, the peat itself were the final product, it would require 6.41 cubic feet of sod, weighing about 128 pounds, to produce one million British Thermal Units (BTU's), compared with 1.26 cubic feet of Eastern coal weighing about 81.9 pounds (Campbell, 1979). Therefore, it is a viable alternative fuel but the costs to the environment of extracting this fuel are unknown.

In addition to peat, large deposits of phosphate are found on the Albemarle-Pamlico Peninsula. Texasgulf's North Carolina Phosphate Company (NCPC) has rights to more than 30,000 acres of the 4th largest phosphate deposit in the nation on Lee Creek in Beaufort county (Miller, 1982). While exploratory tests began in 1963, full-scale commercial operation was not under way until 1966 (Texasgulf, undated). NCPC's overall time schedule includes five years to extract 20 million tons of concentrate, 5 years to dispose of waste, and reclamation to occur at the end of the eleventh year for each pit. The total area owned or leased by NCPC includes approximately 1% each of swamp, pocosin, brackish and saltwater marsh, and freshwater marsh, and approximately 3% of bottomland hardwoods (Mercer, pers. comm., 1982). In the past 15 years, [illegible]% of the wetlands have been altered (Mercer, pers. comm., 1982).

Several permits have been needed through the past fifteen years of operation. In the 1960s, Section 10 permits were required for filling in portions of a river. In 1971-1972, when the state mining law came into effect, a mining permit was required (Mercer, pers. comm., 1982). In 1974, at a meeting with the North Carolina Department of Natural and Economic Resources, a series of permits were suggested for the expansion of the mining operations (Puette, 1974). Among the permits required were state and federal Dredge and Fill permits, a Water Discharge permit, an Air Pollution permit, an NPDES permit, and a Dam Safety permit.

NCPC must obtain certain permits when any part of their holdings is initially opened to mining. Currently, NCPC is working with the COE on an Environmental Assessment for such a previously unmined site. The COE has determined that NCPC may impact 3 1/2 acres of the 11 acres of wetlands they had originally intended to mine, which would leave eight acres of phosphate untouched. NCPC feels that because it would be uneconomical to return to the area in the future, these 8 acres of non-renewable resource will be lost forever if they are not mined at the present time (Mercer, pers. comm., 1982).

The Albemarle-Pamlico peninsula is in need of studies that will provide information on the extent of wetlands in the area. A research team from East Carolina University in North Carolina is currently working on an environmental mapping project, the Atlas project, for four counties on the peninsula - Hyde, Tyrrell, Dare and Washington - and their Outer Banks. Data for the maps, which will be completed by September 1, 1982, were taken from pre-existing information such as 1982 aerial photography flown by EPA and existing USGS 7 1/2 minute topographic maps. Four map series are being completed, each addressing a specific topic:

1) physical property,

2) land use and land cover,

3) active processes, and

4) mineral resources (Mauger, pers. comm., 1982).

The physical property series specifically focuses on soils and their drainage properties, and items such as the location of man-made lands and sewage treatment plants. The information for this series was obtained from a 1980/1981 photographic update of a 1974 topographic map.

The land use and land cover series studies conversion lands based on a U.S. Geological Survey (USGS) scheme modified by Anderson and Roche, biologists on the project, and U.S. Forest Service data when available. This series is more detailed than other land use maps, with forested wetlands being the most detailed. A new category, disrupted grass-shrub wetland, was added to this series. This wetland type has evolved due to the extensive areas of land cleared during the last eight to ten years that has reverted back to wetland. (Mauger, pers. comm., 1982). Based on soil types, photographs, and the work of the biologists, the series has been mapped as accurately as possible.

The third series, active processes, is primarily concerned with the Outer Banks. It includes processes such as erosion and storm activities. No data has been compiled for inland areas. This series is approximately halfway completed. The final series, mineral resources, is done on a smaller scale and is much more generalized than the other series.

The maps, which will eventually be computerized, can assist in the regulatory processes by showing the cumulative impact of activities in an area as opposed to the impact of each individual project or process. With a computerized system, the maps can be updated easily. Although funding for the Atlas Project will cease September 1, 1982, several of the maps are presently being computerized to determine the approximate cost of such digitizing. To complete the process of putting the maps into a computer system, additional funds will be required (Mauger, pers. comm., 1982).

LRIS

North Carolina's Land Resource Information Service (LRIS) illustrates the potential use of a computer geographic information system in making informed resource decisions. The system allows graphic information such as maps to be precisely placed in an x:y coordinate grid system in a computer base. It can then produce color coded and precise computer-drawn maps. If the various wetland studies described in this report were digitized on such a system, wetland acreages and trends of loss in North Carolina and South Carolina could be easily determined and graphically illustrated.

The accuracy of these maps is limited only by the accuracy of the data base itself; the computer has the ability to retain precision of mapped data at both a large and a small scale. For example, property boundaries can be precise to within one one-hundredth of a foot, and area calculations are precise to one one-hundredth of an acre. The computer operator can choose the scale desired when producing maps. Since LRIS uses the State Plane Coordinate System as a geo-referencing structure, legally binding boundaries can be mapped, and maps of differing resolutions are easily integrated. A counterpart to the graphics, which uses the Statistical Analysis System (SAS), can produce statistical printout reports.

In addition to precision, another attractive feature of the system is its ability to store and compile information describing many parts of a state's resources. Categories such as land uses, topography, and population information can be compiled with each other at any resolution consistent with that of the smaller scale data base, and for any map size or shape. Appendices K and L illustrate the use of LRIS in the delineation of marsh areas of Carteret County, North Carolina. Appendix K (1 : 450,000 scale), highlights the marsh areas in Carteret county. Primary roads and natural streams are included. Appendix L (1 : 24,000 scale), enlarges the scale, and at the larger scale, open marsh (lighter green) can be delineated from wooded marsh (darker green). Secondary roads and artificial drainage systems can also be shown. The corresponding statistical printout calculated 54,774.56 acres of open marsh and 79,754.19 acres of wooded marsh in Carteret County. These represented 40.72% and 59.29% respectively of the total marsh area of the county (Simmons, pers. comm., 1982). The combination of graphics and statistics allows output to be tailored to fit the needs and demands of a particular resource problem.

The computer system also allows information to be easily updated over time as resources or land uses change. Further, the system's flexibility allows data entered for one resource problem to be applied to others where appropriate. Implications for wetland management are significant. Mapped wetland areas can be "digitized" or entered into the coordinate data base and delineated by type. Total wetland area can be calculated by type, county, municipality or other category, such as wetland areas over 5 acres in size. Distance from wetlands to urban areas, agricultural areas, or point-sources of pollution can be calculated. Change over time in wetland areas could be correlated with changes in population density, transportation networks, agricultural expansion, water impoundments, or any other category included in the county data set. Flood or impoundment levels can be calculated from topographic contours. Cumulative impacts could be assessed if individual projects in wetlands were entered into the computer.

The accuracy of the data base is a key consideration; note that Appendices K and L are drawn from 1959 USGS topographic maps, and therefore are somewhat out-of-date. Use of the system can be expensive initially as a data base is entered, although the staff feels long-term benefits of constant access to accurate and updatable information is cost beneficial in the long run. Where graphical or statistal information is needed to make a policy decision, a land resources computer system may be a powerful aid in arriving at an equitable decision.

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IX. Appendix A

Wetland Types using Circular 39's Classification System

(Shaw and Fredine, 1956)

Type I	Seasonally flooded basins or flats
Type II	Inland fresh meadows
Type III	Inland shallow fresh marshes
Type IV	Inland deep fresh marshes
Type V	Inland open fresh water
Type VI	Shrub swamps
Type VII	Wooded swamps
Type VIII	Bogs
Type IX	Inland saline flats
Type X	Inland saline marshes
Type XI	Inland open saline water
Type XII	Coastal shallow fresh marshes
Type XIII	Coastal deep fresh marshes
Type XIV	Coastal open fresh water
Type XV	Coastal salt flats
Type XVI	Coastal salt meadows
Type XVII	Irregular flooded salt marshes
Type XVIII	Regularly flooded salt marshes
Type XIX	Sounds and bays
Type XX	Mangrove swamps

X. Appendix B

Summary of all inventory information for North Carolina and South Carolina

YEAR	STATE	AUTHOR	EXTENT OF WETLAND AREAS TYPE OF WETLAND	ACRES
1860	NC	Emmons	swamplands owned by state swamplands in NC	1,500,000 2,000,000
1867	NC	Literary Board	swamplands	1,500,000
1883	NC	Kerr	Principal tracts claimed by Board of Education	839,982
1889	NC SC	Shaler	Fresh water morasses	2,240,000- 2,560,000 1,600,000-1,920,000
1916	NC SC	Pratt	swamps overflowed lands	3,022,000 1,760,000
1923	NC SC	Gray	land mostly too rough ...	11,000,000 6,000,000
1949	NC SC	Wooten and Purcell	land feasible to drain	1,157,000 966,000
1956	NC SC	Shaw and Fredine	wetlands (Circular 39)	4,054,600 3,377,000
1962	NC	Wilson	wetlands in 41 coastal plain counties	4,000,890
1967	NC	Burdick	marshlands	160,574
1968	NC SC	Spinner	marshlands	191,650 514,400
1973	SC	USDA	marsh in Santee river basin	131,500
1973	SC	Don Hill, COE	marshland	2,949,316
1974	NC	US Forest Service	Deep swamps	450,255
1974	NC	US Forest Service	Bottomland hardwoods	2,591,989
1977	SC	Tiner	Tidal wetlands impoundments	433,994 70,451
1977	SC	US forest Service	bottomland hardwoods	2,268,200
1982	NC SC	US Fish and Wildlife Service	Yadkin-Pee Dee Basin	528,214 590,503
1982	NC	Richardson	Pocosins in 41 counties	1,503,000
1962	NC	East Carolina University	Atlas Project - Albemarle-Pamlico	still in progress
1982	NC SC	US Fish and Wildlife Service	Nationwide wetlands	still in progress

XI. Appendix C

Wilmington District COE General Permits.

WILMINGTON DISTRICT. This general permit authorizes placement of vegetative fill material resulting from selective snagging operations performed by or under the sponsorship of Federal, State, or local government, into wetlands and water channels. The permit is not valid where the activity would destroy an endangered or threatened species or endanger their habitat. Neither does it apply to activities adversely affecting National Register of Historic Places or National Wild and Scenic Rivers.

WILMINGTON DISTRICT. This general permit authorizes installation of aerial and subaqueous utility lines with their associated structures spanning navigable waters of the United States. Utility lines must avoid areas of concentrated shellfish production, cannot destroy threatened or endangered species or endanger their habitat, and can not be placed in any part of the national or state wild and scenic river system.

TWENTY COASTAL ZONE COUNTIES. This permit authorizes construction activities which receive all of the following: a Coastal Area Management Act permit, a state permit to dredge and/or fill, and a Section 401 water quality certification. The permit is not applicable to construction when unresolved objections of the State, EPA, NMFS, or the N.C. State Historic Preservation Officer cause the application to be referred by the District Engineer to a higher authority level. A copy of the general permit is contained in Appendix E.

BRUNSWICK NEW HANOVER, PENDER, ONSLOW, CARTERET, HYDE, DARE AND CURRITUCK COUNTIES. In these 8 coastal counties, emergency construction of primary dunes, jetties, bulkheads with backfill, and riprap material may come under a general permit where any necessary excavation material may be taken waterward of mean high water. The Office of Coastal Management decides if an emergency exists or not.

WILMINGTON DISTRICT. This general permit applies to the discharge of liquid effluent from diked upland disposal areas resulting from hydraulic dredging operations. No wetlands may exist within the diked disposal areas, and a public interest review is required for other aspects of any project.

WILMINGTON DISTRICT. Private bulkheads with backfill may be repaired, maintained, or constructed under this general permit where backfill is landward of wetland vegetation; a maximum shoreline length of 200 feet may be covered.

WILMINGTON DISTRICT. Private piers, docks, boathouses, mooring pilings and wooden jetties may be maintained, repaired and constructed under this permit using specifications of the permit, and excluding ocean beaches.

WILMINGTON DISTRICT. Private boat ramps may be maintained, repaired and constructed where no wetland vegetation is excavated or filled during construction or subsequent use of the ramp.

XII. Appendix D
Charleston District COE General Permits.

TIDAL WATERS OF SOUTH CAROLINA (under jurisdiction of the S.C. Coastal Council, within Critical Areas of the coastal counties). This general permit authorizes the installation of private, noncommercial, single-family recreational piers and docks, including fixed walkways, fixed docks, floating docks, and moorings. Certain waterways that contain authorized Federal projects (Atlantic Intracoastal Waterway, Cooper River, and many others) are specifically excluded from this authorization. Also excluded are areas listed in the National Register of Historic Places as either registered or eligible for inclusion therein, and projects within 2000 feet of these areas.

TIDAL WATERS OF SOUTH CAROLINA (work subject to U.S. Coast Guard jurisdiction). This general permit authorizes the placement of fill material into waters and wetlands when associated with minor bridge or culverted roadway crossings or streams, but only when the work is subject to the permitting authority of the U.S. Coast Guard.

LAKE MOULTRIE AND LAKE MARION (Santee-Cooper Lakes). This general permit authorizes the construction, repair and maintenance of private, noncommercial piers, docks, floats and moorings in the waters of the Santee-Cooper lakes.

LAKE MURRAY. This general permit authorizes the construction, repair and maintenance of (1) private docks, boat ramps, mooring buoys, and marine railways for dry storage, (2) seawalls, retainer walls, and rip-rap for erosion control, and (3) minor excavation by the riparian (immediate shoreline) property owners in the waters of Lake Murray.

CLARK HILL LAKE. A general permit was issued by the Savannah District of the Corps of Engineers in August 1976 to authorize the construction and maintenance of rip-rap and bulkheads in Clark Hill Lake in South Carolina and Georgia. Clark Hill lake is a federally operated facility constructed and managed by the Savannah District of the Corps of Engineers. This general permit is administered by the Resource Manager for the project.

CITY OF NORTH MYRTLE BEACH (Cherry Grove). This general permit authorizes the construction, repair and maintenance of private bulkheads, and backfill for protection of private property by the riparian property owners adjacent to artificial canals connecting Hog Inlet, Cherry Grove Beach, and North Myrtle Beach in Horry County, South Carolina.

XIII. Appendix E

Wilmington COE General Permit for

State-permitted Activities

DEPARTMENT OF THE ARMY
GENERAL PERMIT

A general permit to perform work in or affecting navigable waters and navigable waters of the United States upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403) and to Section 404 of the Clean Water Act (33 U.S.C. 1344), is hereby issued by authority of the Secretary of the Army by the

District Engineer
US Army Engineer District, Wilmington
Corps of Engineers
PO Box 1890
Wilmington, NC 28402

To authorize those construction activities that receive prior approval from the State of North Carolina in the form of all the following State authorizations (inclusively) which may be required:

1. Coastal Area Management Act (CAMA) Permit.

2. Permit to Dredge and/or Fill.

3. Water Quality Certification (under Section 401 of the Clean Water Act).

This general permit applies in Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington Counties, North Carolina, US Army Engineer District, Wilmington.

1. Operating Procedures:

a. Applications for State and Federal authorizations will be accepted directly and simultaneously from applicants by both the Wilmington District Engineer and the North Carolina Office of Coastal Management (NCOCM). Receipt of an application by the NCOCM will initiate the field review process to include a site visit and preparation of an Environmental Consultant's Field Report. Receipt of an application by the Corps will initiate the Corps review. Immediately after receipt by the Corps, an application will be assigned an identification number, its receipt will be acknowledged, and a review will be made by the appropriate Corps Area Coordinator to determine if the application should be processed under this general permit. If it is determined that the application requires an individual permit review process, the applicant and the NCOCM will be so notified in writing and the application will be processed in accordance with 33 CFR 325. Also, if it is determined that the application may be processed under this general permit, the applicant and the NCOCM will be furnished written notification. Correspondence to the applicant will include a general description of the appropriate process. The applicant and the North Carolina Division of Environmental Management (NCDEM) will be informed regarding the applicant's need to obtain a Water Quality Certification in accordance with Section 401 of the Clean Water Act prior to validation by the District Engineer in accordance with this general permit.

b. The State review package, to include the Environmental Consultant's Field Report, will be furnished by the Raleigh NCOCM to the Corps, the US Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and the NC State Historic Preservation Officer. Receipt of this package will

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initiate these agencies' review. The agencies will have 30 days from the date of the State review package to furnish the District Engineer any comments or recommendations to include any modifications or conditions which would make the work acceptable. Extensions of time will be granted for agency review only if justified by unusual circumstances. If an extension is granted and would delay issuance of the NCOCM permit, the application will be removed from this general permit process and processed as an individual permit so as not to delay the NCOCM action.

c. This general permit does not, in any way, alter the established procedures or responsibilities, as required by Federal laws and/or administrative regulations with respect to the District Engineer's coordination with the review agencies. The applicant will continue to have opportunity to rebut any objections from review agencies.

d. After agency comments are received, they will be reviewed by the Corps office and a coordinated Federal position will be prepared. Such position may include conditions that would normally be a part of an issued Corps permit. This Federal response will normally be furnished by the Corps to the Raleigh NCOCM office within 45 days after receipt of the State review package. If comments or recommendations from the review agencies include irresolvable objections or recommendations for denial, the application will be withdrawn from this general permit process and the applicant and the Raleigh NCDEM office will be notified immediately in writing. In such case, processing of the application will be continued in accordance with 33 CFR 325, including normal referral procedures, if necessary.

e. After receipt and review of the coordinated Federal position, to include any appropriate conditions, the NCOCM will determine if there is any conflict with State agency positions, law, regulation, or policy. If there is no conflict, an NCOCM permit will be developed incorporating the State and Federal positions. Copies of the permit will be furnished to the applicant and the Corps. Where required, a copy of a Section 401 Water Quality Certification from the NCDEM will also be furnished to the applicant and the Corps. Issuance of both the NCOCM permit and the NCDEM 401 Certification, if required, must precede validation of this general permit by the District Engineer or his representative.

f. If, at any time after applications as described in paragraph 1.a. are received but before the State authorization in the form of a CAMA Permit for Major Development and/or a Permit to Dredge and/or Fill is/are issued, the N.C. Division of Environmental Management (if a Section 401 Water Quality Certification is required) or the N.C. Office of Coastal Management so requests, the application will be processed in accordance with 33 CFR 325, including normal referral procedures. The N.C. Office of Coastal Management or the N.C. Division of Environmental Management shall base any such request on grounds that the activities which are the subject of the application will or may have more than a minimal adverse impact on the environment or that such activities are more appropriately authorized by an individual permit.

g. If there is a conflict between a coordinated Federal position and the State position, the NCOCM will contact the Corps within 10 days of receipt of the Federal position to resolve the conflict. If the conflict is resolved, the NCOCM permit will be issued and the authority of this general permit will apply. If the conflict is not resolved, the application will not be further considered under this general permit and District Engineer processing will continue in accordance with 33 CFR 325.

h. If the NCOCM permit is denied, the applicant will be informed that Federal authorization under this general permit is also denied.

i. Following issuance of a NCOCM permit, the project will be monitored by NCOCM personnel and inspected for compliance with the permit in accordance with normal NCOCM regulations and procedures. The project may also be inspected by Corps personnel. If at any time a violation of the NCOCM permit is discovered which would also have been a violation of the Federal positions on the permit, enforcement action may be taken by both NCOCM and the

Corps in accordance with their respective regulations and policies. Corps enforcement will proceed as a violation of this general permit.

2. General Considerations:

a. All activities identified and authorized by this general permit must be consistent with the terms and conditions of this authorization. Any activity accomplished but not specifically identified and authorized herein, may constitute a violation of Federal statute and result in legal proceedings as may be considered appropriate by the United States Government.

b. All activities authorized by this general permit that will involve the placement of dredged or fill material into waters of the United States or ocean waters, shall be consistent with applicable water quality standards, effluent limitations, and standards of performance, prohibitions, pretreatment standards and management practices established pursuant to the Clean Water Act (33 U.S.C. 1344), the Marine Protection, Research and Sanctuaries Act (33 U.S.C. 1413) and pursuant to applicable State and local law. To assure preservation of water quality, before any work is authorized by this general permit, a property owner, if required to do so, must apply for and obtain a Water Quality Certification from NCDEM in accordance with Section 401 of the Clean Water Act.

c. The general permit will not authorize any activity which might affect a threatened or endangered species as identified under the Endangered Species Act (16 U.S.C. 1531) or adversely modify designated critical habitat of such species without consultation with the U.S. Fish and Wildlife Service.

d. To use this general permit, a property owner must make every reasonable effort to prosecute the work authorized herein in a manner so as to minimize any adverse impact of the work on fish, wildlife, and natural environmental values.

e. To use this general permit, a property owner must prosecute the work authorized herein in a manner so as to minimize any degradation of water quality.

f. A property owner shall permit the District Engineer or his representative to make periodic inspections at any time deemed necessary in order to assure that the activity is being performed in strict accordance with the terms and conditons of this general permit.

g. The property owner will maintain any structure authorized by this general permit in good condition and in accordance with approved plans and drawings.

h. This general permit does not convey any rights, either in real estate or material, or any exclusive privileges; and it does not authorize any injury to property or invasion of rights or any infringement of Federal, State or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

i. Authorization provided by this general permit may be either modified, suspended, or revoked in whole or in part if the District Engineer, acting on behalf of the Secretary of the Army, determines that such action would be in the best public interest. Unless subject to modification, suspension, or revocation, the term of this general permit shall be 5 years. Any modification, suspension, or revocation of authorization shall not be the basis for any claim for damages against the US Government.

j. If subsequent to performance of the work should any information and/or data furnished by the applicant prove to be false, incomplete, or inaccurate, the authorization may be modified, suspended, or revoked in whole or in part, and/or the US Government may institute appropriate legal proceedings.

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k. There will be no unreasonable interference with navigation or the right of the public to riparian access by the existence or use of the activities authorized by this general permit.

l. A property owner upon receipt of written notice from the District Engineer of failure to comply with the terms and conditions of this general permit shall, with 60 days without expense to the US Government and in such manner as the District Engineer may direct, effect compliance with the terms and conditons or return his worksite to a prework conditions.

m. This general permit does not apply to activities that would adversely affect an area listed in the National Register of Historic Places or an area which the Secretary of the Interior through the keeper of the National Register of Historic Places would determine eligible for inclusion in the Register. Proposals under this general permit will be furnished to the State Historic Preservation Officer for his comments prior to final permit acitivity authorization. Also, this general permit does not apply on wild and scenic rivers established pursuant to the Wild and Scenic Rivers Act (16 U.S.C. 1278).

n. This general permit does not authorize the interference with any existing or proposed Federal project and the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

o. Any work activity performed in any area under the regulatory jurisdiction of the Corps of Engineers which does not comply with the terms and conditions of this general permit, must have prior approval under the customary regulations administered by the Corps of Engineers as found in 33 CFR 320-329.

3. Conditions and Procedures:

a. General. The aforementioned, detailed Operation Procedures apply to construction activities that, prior to issuance of this general permit, required State authorization in the form of a Coastal Area Management Act (CAMA) Permit for major development and/or a Permit to Excavate and/or Fill and Federal authorization as required by Section 10 fo the River and Harbor Act (33 U.S.C. 403) and/or Section 404 of the Clean Water Act (33 U.S.C. 1344.)

b. Application. Any member of the general public proposing to accomplish construction activities under the authorization of this general permit must submit an appropriate, complete application with drawings to the Wilmington District Engineer and the appropriate regional office of NCOCM.

c. Validation. No work may proceed under this general permit until and unless the District Engineer or his representative validates that the procedures and other requirements of the general permit have been satisfied.

4. Exemptions:

a. This general permit will not be applicable to proposed construction when the District Engineer believes that authorization may be warranted but that the proposed activity might significantly affect the quality of the human environment.

b. This general permit will not be applicable to proposed construction when the District Engineer determines after any necessary investigations that the proposed activity would adversely affect areas which possess historic, cultural, scenic, conservation, or recreational values. Application of this exemption applies to:

(1) Rivers named in Section 3 of the Wild and Scenic Rivers Act (15 U.S.C. 1273), those proposed for inclusion as provided by Sections 3 and 5 of the Act, and wild, scenic, and recreational rivers established by State and local entities.

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(2) Historic, cultural, or archeological sites listed in or eligible for inclusion in the National Register of Historic Places as defined in the National Historic Preservation Act of 1966 and its codified regulations and in the National Historic Preservation Amendments Act of 1980.

(3) Sites included in or determined eligible for listing in the National Registry of Natural Landmarks.

(4) Endangered or threatened species or habitat of such species as determined by the Secretaries of Interior or Commerce and conserved in accordance with the Endangered Species Act (16 U.S.C. 1531).

c. This general permit will not be applicable to proposed construction when unresolved objections of the aforementioned review agencies or the State make it necessary that the District Engineer refer the application to a higher level of authority for review.

d. At his discretion, at any time during the processing cycle, the District Engineer may determine that this general permit will not be applicable to a specific construction proposal. In such case, the procedure for processing an individual permit in accordance with 33 CFR 325 will be available.

BY AUTHORITY OF THE SECRETARY OF THE ARMY

Robert K. Hughes

ROBERT K. HUGHES
Colonel, Corps of Engineers
District Engineer

XIV. Appendix F

Federally-owned lands in North Carolina and South Carolina†

NAME	ADMINISTERING AGENCY	TOTAL ACREAGE	WETLAND INFORMATION
Cape Hatteras National Seashore, NC	National Park Service (NPS)	30,326	mostly tidal marsh
Cape Lookout National Seashore, NC	NPS	24,500	mostly tidal marsh
Mackay Island National Wildlife Refuge, NC	US Fish and Wildlife Service (USFWS)	7,056	4991 acres irregularly flooded salt marsh
Mattamuskeet National Wildlife Refuge, NC	USFWS	50,180	6240 acres shallow freshwater marsh
Pea Island National Wildlife Refuge, NC	USFWS	5,915	324 acres irregularly flooded salt marsh; 328 acres salt flat
Cedar Island National Wildlife Refuge, NC	USFWS	17,125	10,000 acres irregularly flooded salt marsh
Swan Quarter National Wildlife Refuge, NC	USFWS	42,347	12,730 acres regularly flooded salt marsh
Pee Dee National Wildlife Refuge, NC	USFWS	4,497 (to be expanded to 10,989)	2250 acres seasonally flooded basins and flats; 15 shallow fresh marsh; 10 deep fresh marsh; 5 shrub swamp; 25 other
Dismal Swamp National Wildlife Refuge, (NC portion)	USFWS	24,379	all wooded swamp
Pungo National Wildlife Refuge, NC	USFWS	12,350	400 acres shallow fresh marsh; 50 deep fresh marsh; 200 bog; 1000 pocosin; 30 other
Cape Romain National Wildlife Refuge, SC	USFWS	34,218	75 acres seasonally flooded basins and flats; 525 shallow fresh marsh; 1500 deep fresh marsh; 8340 irregularly flooded salt marsh; 19,500 regularly flooded salt marsh

XIV. Appendix F (continued)

NAME	ADMINISTERING AGENCY	TOTAL ACREAGE	WETLAND INFORMATION
Carolina Sandhills National Wildlife Refuge, SC	USFWS	45,591	147 acres bog; 2129 wooded swamp
Santee National Wildlife Refuge, SC	USFWS	43,621	1622 acres deep freshwater marsh
Savannah National Wildlife Refuge (SC portion)	USFWS	15,028	hardwood river-bottom swamp and freshwater marsh; includes Argent Swamp (12,480 acres)
Pinckney Island National Wildlife Refuge, SC	USFWS		2729 acres regularly flooded salt marsh
Croatan National Forest NC	US Forest Service (USFS)	152,351	25,854 acres pocosin; 300 swamp
Nantahala National Forest, NC	USFS	465,362	*
Pisgah National Forest, NC	USFS	485,723	*
Uwharrie National Forest, NC	USFS	45,982	*
Francis Marion National Forest, SC	USFS	249,401	mostly cypress-tupelo riverine swamps and bogs; includes Little Wambaw Swamp Scenic Area (1025 acres) and I'On Swamp
Sumter National Forest, SC	USFS	357,913	*
Great Smokey Mountains National Park, (NC portion)	USPS	274,794	*
Camp le Jeune Marine Base	US Marine Corps	*	5330 pocosin
Fort Bragg Military Reservation	US Army	*	*

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† Does not include National Historic Sites or National Memorials

* Information unknown

XV. Appendix G
State-owned lands in North Carolina

NAME	ADMINISTERING AGENCY	TOTAL ACREAGE	WETLAND INFORMATION
Carolina Beach State Park	Division of Parks and Recreation (DPR)	1,740	includes salt marsh 5 acres pocosin
Cliffs-of-the Neuse State Park	DPR	593	*
Fort Macon Historical Site	DPR	385	includes salt marsh
Goose Creek State Park	DPR	1,208	marsh and swamp forest
Hammocks Beach State Park	DPR	892	includes salt marsh
Jockey's Ridge State Park	DPR	270	*
Jones Lake State Park	DPR	2,208	*
Lake Waccamaw State Park	DPR	273	*
Merchant's Millpond State Park	DPR	1,947	swamp forest
Pettigrew State Park	DPR	768	Carolina bay
Singletary Lake State Park	DPR	1,221	*
Theodore Roosevelt State Natural Area	DPR	265	includes salt marsh
Weymouth Woods Nature Preserve	DPR	425	12 acres pocosin
Boone's Cave State Park	DPR	110	*
Duke Power State Park	DPR	1,399	*
Eno River State Park	DPR	1,568	bottomland hardwoods
Kerr Lake State Park	DPR	2,728	*
Medoc Mountain State Park	DPR	2,305	floodplain hardwood forest
Morrow Mountain State Park	DPR	4,508	*
Raven Rock State Park	DPR	2,723	floodplain hardwoods
William B. Umstead State Park	DPR	5,334	*

* Information unknown

XV. Appendix G (continued)

NAME	ADMINISTERING AGENCY	TOTAL ACREAGE	WETLAND INFORMATION
Crowder's Mountain State Park	DPR	1,966	*
Hanging Rock State Park	DPR	4,819	*
Mount Jefferson State Park	DPR	541	*
Mount Mitchell State Park	DPR	1,469	*
Pilot Mountain State Park	DPR	3,802	*
South Mountains State Park	DPR	5,779	*
Stone Mountain State Park	DPR	10,463	*
Bushy Lake State Park	DPR	1,004	Carolina bay
Dismal Swamp State Park	DPR	*	1500 acres pocosin
Bladen Lakes State Forest	Division of Forest Resources (DFR)	36,000	includes Turkey Oak Natural Area (Carolina bay) and Salter Lake Natural Area (Carolina bay with cypress)

* Information unknown

XVI. Appendix H
State-owned lands in South Carolina

NAME	ADMINISTERING AGENCY	TOTAL ACREAGE	WETLAND INFORMATION
Aiken State Park	Division of State Parks (DSP)	1,067	evergreen shrub; 250 acres bottomland hardwood
Andrew Jackson State Park	DSP	360	*
Baker Creek State Park	DSP	1,305	*
Barnwell State Park	DSP	307	*
Caesar's Head State Park	DSP	10,204 (part in NC)	*
Charles Towne Landing State Park	DSP	*	*
Cheraw State Park	DSP	7,361	850 acres bottomland hardwood
Chester State Park	DSP	523	*
Colleton State Park	DSP	35	*
Croft State Park	DSP	7,088	*
Dreher Island	DSP	340	*
Edisto Beach State Park	DSP	1,255	1/3 salt marsh
Givhans Ferry State Park	DSP	1,235	contains floodplain swamp
Goodale State Park	DSP	700	*
Greenwood State Park	DSP	914	*
Hamilton Branch State Park	DSP	731	*
Hampton Plantation State Park	DSP	322	*
Hickory Knob State Park	DSP	1,091	*
Hunting Island State Park	DSP	5,000	3/4 salt marsh

* Information unknown

XVI. Appendix E (continued)

Huntington Beach State Park	DSP	2,500	salt marsh; some cypress swamp
Keowee-Toxaway State Park	DSP	1,000	*
Kings Mountain State Park	DSP	6,141	*
Landsford Canal State Park	DSP	200	*
Lee State Park	DSP	2,839	mostly bottomland hardwood
Little Pee Dee State Park	DSP	835	contains swamp
Lynches River State Park	DSP	668	*
Myrtle Beach State Park	DSP	312	*
Oconee State Park	DSP	1,165	*
Old Dorchester State Park	DSP	97	*
Paris Mountain State Park	DSP	1,275	8
Pleasant Ridge State Park	DSP	300	*
Poinsett State Park	DSP	1,000	*
Redcliffe State Park	DSP	350	*
Rivers Bridge State Park	DSP	390	contains swamp
Rose Hill State Park	DSP	44	*
Sadlers Creek State Park	DSP	395	*
Santee State Park	DSP	2,364	some bottomland hardwood
Sesquicentennial State Park	DSP	1,455	*
Table Rock State Park	DSP	3,068	*
Wildcat Wayside State Park	DSP	63	*
Woods Bay State Park	DSP	1,541	mostly cypress-tupelo swamp

* Information unknown

XVI. Appendix H (continued)

Webb Wildlife Center	Wildlife and Marine Resources Department (WMRD)	5,866	*
Bear Island Game Management Area	WMRD	7,500	mostly salt marsh
Turtle Island Game Management Area	WMRD	1,700	salt marsh
Victoria Bluff Game Management Area	WMRD	1,255	"Florida scrub" and wet depressions
Santee Delta Game Management Area	WMRD	1,501	marsh
Samworth Game Management Area	WMRD	1,275	marsh
Santee Coastal Reserve	WMRD	23,024	delta marsh, freshwater marsh and rice impoundments; includes 14 Carolina bays, Blake's Reserve (1252 acres cypress swamp) and Murphy's Island (7310 acres salt marsh)
Caper's Island (Heritage Preserve)	WMRD	3,000	1,090 acres salt marsh; 50 tidal creeks; 110 fresh and brackish water impoundments; many low-lying swampy areas
Tom Yawkey Wildlife Center (Heritage Preserve)	WMRD	20,000	about 10,000 acres salt marsh or impoundments
Manchester State Forest	Forestry Commission (FC)	28,830	4000 acres pocosin; 1000 bottomland hardwood; contains Wateree Swamp (old pond cypress and tupelo) and Juniper Bay Natural Area (a Carolina bay)
Sand Hills State Forest	FC	92,000	includes about 12,000 acres of wetlands

* Information unknown

XVII. Appendix I
North Carolina Legislation Affecting Wetlands

<table>
<tr><th>Brief Description</th><th>NC General Statute Citation</th><th>Year</th><th>Administering Agency</th></tr>
<tr><td>Coastal Area Management Act</td><td>§113A-100 to §113A-229</td><td>1974</td><td>OCM</td></tr>
<tr><td colspan="4">The Act creates the Coastal Resources Commission which designates Areas of Environmental Concern (AECs) in 20 coastal counties. Each county adopts a land use plan. Permits are required for activities in AECs and activities in counties must be consistent with state and local land use plans.</td></tr>
<tr><td>Orders to control activities in wetlands.</td><td>§113-230</td><td>1974</td><td>NRCD</td></tr>
<tr><td colspan="4">The Secretary of the Department of Natural Resources and Community Development may adopt, amend, modify, or repeal orders controlling alteration of coastal wetlands.</td></tr>
<tr><td>Dredge and Fill Act</td><td>§113-229</td><td>1969</td><td>OCM</td></tr>
<tr><td colspan="4">Requires permits for excavation of bottom materials or filling to create dry land or dispose of dredge spoil in any estuarine waters, tidelands, marshlands, or state-owned lakes.</td></tr>
<tr><td>Land Acquisition Act</td><td>§146-1 et seq.</td><td>1957</td><td>Department of Administration</td></tr>
<tr><td colspan="4">The Department of Administration has the power to manage, control, and sell swamplands and submerged lands. North Carolina may acquire land in order to carry out the public interest, which may include preservation of estuarine areas.</td></tr>
<tr><td>Easement to fill State lands</td><td>§146-6[c]</td><td>1957</td><td>Department of Administration</td></tr>
<tr><td colspan="4">An easement is required to fill state land above the normal high water mark of navigable waters by filling.</td></tr>
<tr><td>Mosquito Control Act</td><td>§130-23</td><td></td><td>Department of Human Resources</td></tr>
<tr><td colspan="4">Mosquito control districts can be created by a board of commissioners. The district may take any steps necessary to control mosquitoes even to land acquisition. Projects must demonstrate public need and are bound by Section 404 and CAMA.</td></tr>
<tr><td>Soil Conservation Districts Law</td><td>§139-1</td><td>1937</td><td>NRCD</td></tr>
<tr><td colspan="4">Provides for conservation of soil and water resources in the state via the formation of Soil and Water Conservation Districts which can apply for assistance from SCS under P.L. 83-566. This law includes the Small Watershed Act of 1959 at §139-9.</td></tr>
<tr><td>Drainage Acts</td><td>§156-1 et seq.</td><td>various dates</td><td>NRCD</td></tr>
<tr><td colspan="4">Collecting regulations requiring to drain high ground or wetland in the state. All above state and federal permits are necessary.</td></tr>
</table>

Sedimentation Pollution Control Act §113A-54 1973 NRCD

Approval must be obtained before engaging in land disturbing activity involving greater than or equal to 1 acre of land. Exemptions include forestry and agriculture.

State Environmental Protection Act §113A-4 1971 NRCD

Impacts of state activities on the surrounding environment must be analyzed. If negative environmental effects outweigh the positive ones, a decision must reflect this.

Mining Act §74-51 1971 NRCD

A permit is required to mine or extract minerals, ores, or other solid matter.

Natural and Scenic Rivers Act §113A-30 1971 NRCD

Land use is regulated in Natural and Scenic River Areas.

Administration of Historic Properties §121-9 Department of Cultural Resources

The Department may acquire, preserve, and protect property of significance.

XVIII. Appendix J

South Carolina Legislation Affecting Wetlands

Brief Description	S.C. Code Citation	Act No.	Year	Administering Agency
Budget and Control Board's Grant of Easement over State Vacant and Marsh Lands	1-11-80 to 90	Act 159	1963	Budget and Control Board

Act authorizes the Board to grant easements and rights-of-way for construction or maintenance of roads, power or pipe lines over state vacant and marsh lands if the interest of the state is not adversely affected.

Recreation Land Trust Fund	51-11-10	Act 946	1974	DSP

Act assists in the maintenance and funding of state parks and other recreational areas.

Coastal Management Act	48-39-10	Act 123	1977	SCCC

Act creates the Coastal Council and calls for a coastal management program which protects coastal lands and water resources and regulates use of critical areas (coastal waters, tidelands, beaches and primary sand dunes), while assuring balanced economic development and participation of all levels of government and the general public in development of management plan.

Heritage Trust Program	51-17-10	Act 600	1976	WMRD

Act establishes the Heritage Trust Program directed toward the identification, inventory and preservation and management of important natural and cultural feature and areas in the state.

S.C. Scenic Rivers Act	51-5-10	Act 1106	1974	WRC and WMRD

Act establishes a program of voluntary donation of land adjacent to scenic rivers for the perpetual protection of their scenic qualities.

Nongame and Endangered Species Conservation Act	50-15-10	Act 1125	1974	WMRD

Act provides for the identification (listing) and protection of endangered fish and wildlife found in the state.

Watershed Conservation Districts Law	48-19-10	Act 613	1967	LRCC in cooperation with SCS

Act enables the establishment of watershed districts in and among the counties of the state for carrying out practices and projects of soil and water conservation and development and for participating in watershed and flood prevention programs under P.L. 566.

XVIII. Appendix J (continued)

S.C. Water Resources Planning and Coordination Act   49-3-10   Act 61   1967   WRC

Act creates the S.C. Water Resources Commission and allows for studies and programs to accomplish statewide and interstate water resource planning and coordination.

S.C. Mining Act   48-19-10   Act 274   1973   LRCC

Act protects and conserves soil and water resources by requiring a plan for reclamation of mined land implementation of practices for protecting the surrounding area from the harmful effects of mining.

State Development Board Act   13-3-10   Act 122 (as amended)   1945   State Development Board

Act established the State Development Board to develop and carry out plans and programs to promote the economic development of the state's physical and human resources.

Drainage Acts   49-17-10   1911   State Drainage Board
49-19-10   1920

Act promotes the leveeing, ditching, draining and reclamation of wet and overflowed lands. Establishes drainage districts and appoints a drainage board to review projects.

Public Service Authority Law   58-31-30   1934   Public Service Authority

Act gives authority to Public Service Authority to reclaim and drain swampy and flooded lands in the Santee, Cooper, and Congaree river basins.

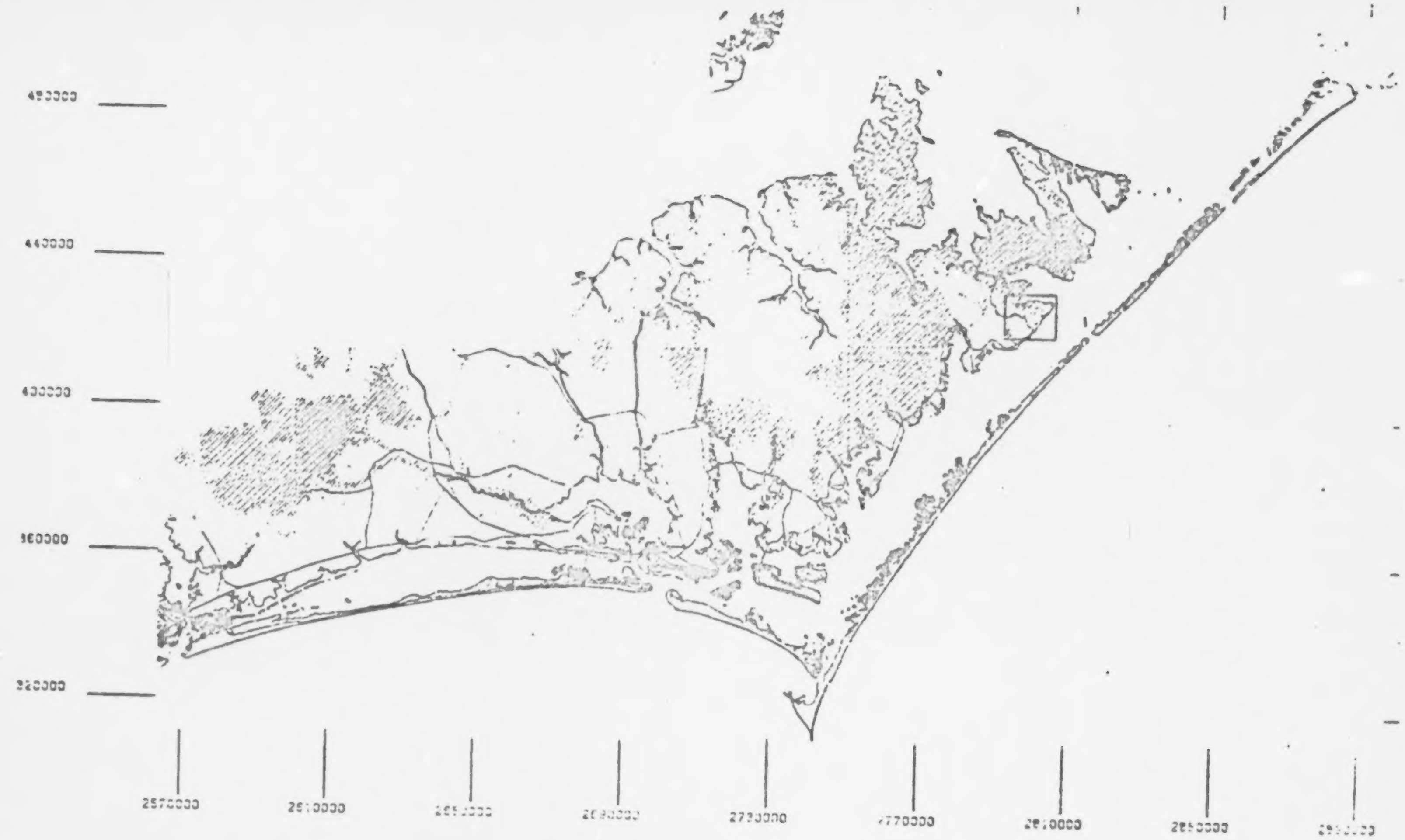
Budget and Control Board's grant of leases for phosphate mining   10-9-10   Budget and Control Board

Act authorizes the state Budget and Control Board to issue leases for phosphate mining.

Mosquito Control Authority of DHEC   44-1-140, R61-45   DHEC

Act gives Department of Health and Environmental Control authority to control disease-bearing insects, including the impounding of waters for such purpose. Regulations require a permit to impound water for these impoundments.

LRIS MAPS CONTAINED IN COPY # 1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2650000
2690000
2730000
2770000
2810000
2850000
2890000

LRIS

LAND RESOURCES
INFORMATION SERVICE
NC DEPT OF NR&CD
919/733-2090

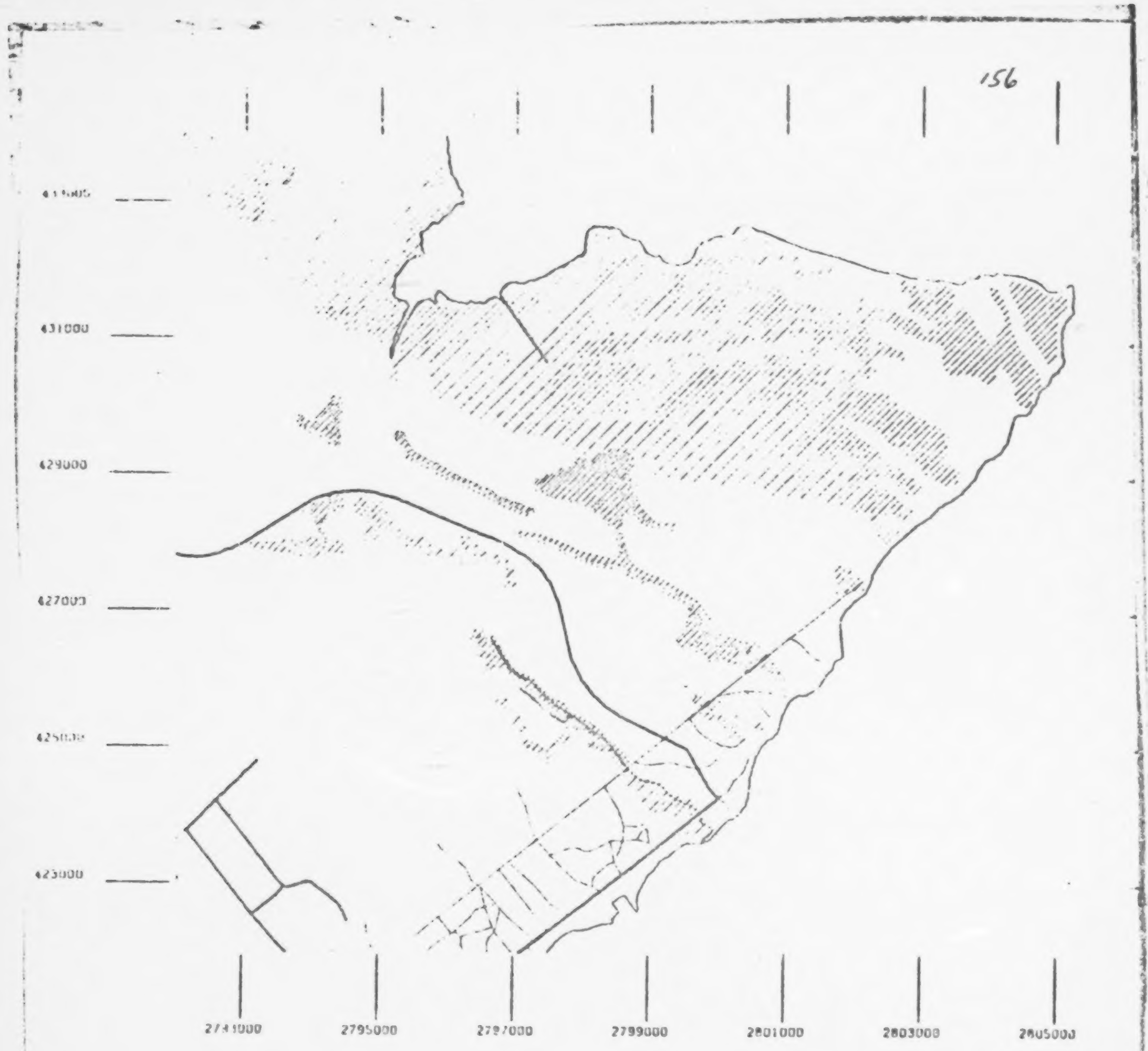
SCALE 1: 450,000
1 INCH = 37,500 FT
2 18 1983
WD. ATLAN. SL. L1
ORIG SCALE 1: 18000

NORTH

PROJECT NO 59

XIX. Appendix K

LRIS Map #1


433000
431000
429000
427000
425000
423000
2793000
2795000
2797000
2799000
2801000
2803000
2805000

XX. Appendix L
LRIS Map #2

PROJECT NO 0

LRIS
LAND RESOURCES
INFORMATION SERVICE
NC DEPT OF NR&CD
919/733-2090

SCALE 1: 24000
1 INCH = 2000 FT
2 18 1983
WD.ATLAN.SL.11
ORIG SCALE 1: 18000

XXII. Appendix H

Duke University questionnaire forms for federal, state, industrial, and conservation groups.

QUESTIONNAIRE FOR CONSERVATION GROUPS

1. How many acres of wetlands are there in the state?
   swamp_____ freshwater marsh_____
   bog_____ bottomland hardwood_____
   saltwater marsh_____

   What are your sources for these figures?

2. How many acres of wetlands does your group own or manage?

3. What has been the percent change of wetland acreage in the last 10 years? 100 years?

4. Please rank the major factors causing wetland losses in coastal and inland areas in your jurisdiction?
   ___agricultural drainage
   ___timberland development
   ___urban development
   ___socioeconomic pressures
   ___changes in governmental policies and programs
   ___mosquito control programs
   ___other

5. What actions have you taken to mitigate wetland development trends?
   ___letters to legislators and other policy-makers
   ___lobbying
   ___public education
   ___acquisition programs
   ___other

6. Are there any wetland areas unprotected by state, federal or private programs?

7. Are there inconsistencies in Federal and State programs? If so, in what areas?
   ___type of mitigation measures suggested
   ___extent of mitigation required
   ___definition of wetlands
   ___jurisdiction
   ___other

8. Are a) cumulative impacts,
   b) secondary impacts, and
   c) long-term impacts addressed by the permit process?

9. Have recent attempts to improve the Federal-State permitting process been successful? If so, what specific changes have helped?
   ___joint permitting
   ___general permits
   ___other

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10. In what stages of the 404 permitting process are you involved?
___identification and referral of 404 activities
procedure
number identified each year
source of referral (government agencies, neighbors, group members...)
___pre- or post- application consultation
percent of total
percent resulting in modification of action
specific mitigation measures suggested
___application review and agency recommendation
what agencies are involved in this process
how long does it take
what are the delays
specific mitigation measures suggested
___follow-up/enforcement
number of permit violations found each year
percent resolved
percent litigated

11. Is the 404 program effective in regulating wetland development? If not, what are its problems?
___exempted activities
___delays in permit review
___limited jurisdiction
___duplication of state programs
___other

12. How do you feel about the the proposed general permit for converting some coastal land to agricultural use?

13. What actions should be taken to improve wetland protection?
___state assumption of full 404 process
___state assumption of 404 permitting in non-navigable waters
___adoption of state wetlands law
___expansion of Corps 404 jurisdiction
___proposed regulatory reforms (reducing uncertainty and delay, giving states more authority and responsibility, decreasing conflict and overlapping policies, expanding the use of general permits, changing jurisdictional control of 404)
___other

QUESTIONNAIRE FOR STATE AGENCIES

Name ____________________
Agency ____________________
Title ____________________

Address ____________________
____
Phone ( ) ____________________
Date ____________________

Introduction

a. Who we are and what we do
b. 3 tasks; inventory, programs impacts, 404 impacts
c. definitions - swamp, bog, marsh (salt and fresh), bottomland hardwoods

I. Inventory and Trends

*1. How many acres of wetlands are there in your state?

- swamp
- saltwater marsh
- bog
- freshwater marsh
- bottomland hardwood
- our sources
  - how does this compare with your figures
  - additional information/updates
  - source for these
    - agency/author
    - areal coverage
    - accuracy
    - natural/disturbed
  - rice fields (impoundments SC)

*2. More importantly, what has been the percent change in wetland acreage during the past 10 years? during the past 100 years?

- source
- dates
- agency/authors
- accuracy

*3. What have been the major factors causing wetland losses in coastal and inland areas in your state? Why?

- agricultural drainage
  - specific examples
- timberland development
  - specific examples
- urban development
  - specific examples
- economic pressures
  - specific examples
- political pressures
- specific government programs
  - PL 566, mosquito control, etc.
- other

What have been the two or three most important factors?

II. Program Impacts

*4. Which programs are most effective in regulating wetland development?

Federal Programs:
- .Clean Water Act (Sections 404,401,402)
- .Rivers and Harbors Act (Section 10)
- .Flood Control Act (1936)
- .Executive Order 11988
- .Executive Order 11990
- .acquisition programs (Dingell-Johnson, Pittman-Robertson, ESA, Scenic Rivers, etc)
- .Water Bank Act
- .Watershed Protection and Flood Prevention Act (P.L. 566)
- .Coastal Zone Management Act
- .other

North Carolina Programs:
- .Coastal Area Management Act
- .Floodway Law
- .Natural and Scenic Rivers Act
- .acquisition programs
- .other

South Carolina Programs:
- .Coastal Management Act
- .Endangered Species Conservation
- .Scenic Rivers Act
- .acquisition programs
- .Forestry Commission Low Country Resource Conservation and Development Project
- .other

*5. What federal programs and policies overlap with or are included in state programs?

*6. What are the main problems that your agency faces in controlling the use of wetlands?

- funding
- lack of information
- lack of technical expertise
- monitoring/enforcement
- lack of enabling legislation

*7. Are there certain types or regions of wetlands that are unprotected by state, federal or private programs?

- types
- regions
- specific examples

III. 404

*8. In what stages of the 404 permitting process are you involved?

- identification and referral of 404 activities procedure
  - staff # & distribution
  - notification methods
- other sources of referral
  - number of actions identified

- pre- or post- application consultation
    - percent of total
    - percent resulting in modification of action
    - specific mitigation measures suggested
- application review and agency recommendation
    - what agencies are involved in this process
    - how long does it take
    - what are the delays
- follow-up/enforcement
    - procedure
    - number of permit violations found

*9. What type or restitution or prosecution is employed? Is the restitution usually voluntary or mandated?

- how many "after-the-fact" permits are granted
- how many prosecutions
- # of fines collected
- amount of fines total
- other forms of restitution

*10. What actions should be taken to improve the effectiveness of the 404 program in regulating wetland development? What specific problems need addressing?

- exempted activities
- delays in permit review
- limited jurisdiction
- duplication of state programs
- other

*11. What other actions should be taken to improve wetland protection?

- state assumption of full 404 process
- state assumption of 404 permitting in non-navigable waters
- adoption of state wetlands laws
- Federal wetland protection legislation
- expansion of Corps 404 jurisdiction
- other

QUESTIONNAIRE FOR FEDERAL AGENCIES

Name ______________________
Agency ______________________
Title ______________________

Address ______________________
____
Phone ( ) ______________________
Date ______________________

Introduction

a. Who we are and what we do
b. 3 tasks; inventory, programs impacts, 404 impacts
c. definitions - swamp, bog, marsh (salt and fresh), bottomland hardwoods

I. Inventory and Trends

*1. How many acres of wetlands are there in your district or area?

- swamp
- saltwater marsh
- bog
- freshwater marsh
- bottomland hardwood
- our sources
  - how does this compare with your figures
  - additional information/updates
  - source for these
    - agency/author
    - areal coverage
    - accuracy
    - natural/disturbed
  - rice fields (impoundments SC)

*2. More importantly, what has been the percent change in wetland acreage during the past 10 years? during the past 100 years?

- source
- dates
- agency/authors
- accuracy

*3. What have been the major factors causing wetland losses in coastal and inland areas in your jurisdiction? Why?

- agricultural drainage
  - specific examples
- timberland development
  - specific examples
- urban development
  - specific examples
- economic pressures
  - specific examples
- political pressures
- specific government programs
  - PL 566, mosquito control, etc.
- other

What have been the two or three most important factors?

II. Program Impacts

*4. Which programs are most effective in regulating wetland development?

Federal Programs:
- .Clean Water Act (Sections 404,401,402)
- .Rivers and Harbors Act (Section 10)
- .Flood Control Act (1936)
- .Executive Order 11988
- .Executive Order 11990
- .acquisition programs (Dingell-Johnson, Pittman-Robertson, ESA, Scenic Rivers, etc)
- .Water Bank Act
- .Watershed Protection and Flood Prevention Act (P.L. 566)
- .Coastal Zone Management Act
- .other

North Carolina Programs:
- .Coastal Area Management Act
- .Floodway Law
- .Natural and Scenic Rivers Act
- .acquisition programs
- .other

South Carolina Programs:
- .Coastal Management Act
- .Endangered Species Conservation
- .Scenic Rivers Act
- .acquisition programs
- .Forestry Commission Low Country Resource Conservation and Development Project
- .other

*5. What federal programs and policies overlap with or are included in state programs?

*6. What are the main problems that your agency faces in controlling the use of wetlands?

- . funding
- . lack of information
- . lack of technical expertise
- . monitoring/enforcement
- . lack of enabling legislation

*7. Are there certain types or regions of wetlands that are unprotected by state, federal or private programs?

- . types
- . regions
- . specific examples

III. 404

*8. In what stages of the 404 permitting process are you involved?

- . identification and referral of 404 activities procedure
  - . staff # & distribution
  - . notification methods
- . other sources of referral
  - . number of actions identified

- pre- or post- application consultation
    - percent of total
    - percent resulting in modification of action
    - specific mitigation measures suggested
- application review and agency recommendation
    - what agencies are involved in this process
    - how long does it take
    - what are the delays
- follow-up/enforcement
    - procedure
    - number of permit violations found

*9. What type or restitution or prosecution is employed? Is the restitution usually voluntary or mandated?

- how many "after-the-fact" permits are granted
- how many prosecutions
- # of fines collected
- amount of fines total
- other forms of restitution

*10. What actions should be taken to improve the effectiveness of the 404 program in regulating wetland development? What specific problems need addressing?

- exempted activities
- delays in permit review
- limited jurisdiction
- duplication of state programs
- other

*11. What other actions should be taken to improve wetland protection?

- state assumption of full 404 process
- state assumption of 404 permitting in non-navigable waters
- adoption of state wetlands laws
- Federal wetland protection legislation
- expansion of Corps 404 jurisdiction
- other

QUESTIONNAIRE FOR INDUSTRIES

1. What percent of your lands are currently wetlands?
   swamp______ freshwater marsh______
   bog______ bottomland hardwood______
   saltwater marsh______

2. What percent of your original wetland acreage has been modified? In the last 10 years? In the last 100 years?

3. What technological changes specific to your business have affected wetland acreages?

4. What wetland regulations and programs have influenced your land-use decisions? How?

5. What are the major problems you have encountered in obtaining permits to modify wetlands on your property?
   for example:
   ___pre-consultation delays
   ___agency review delays
   ___requirements for EIA
   ___inter-agency dispute
   ___ambiguity in regulations
   ___other

6. In response to state and federal programs concerning wetlands, what actions do you take to mitigate for wetland loss?

   What percent of mitigations are done upon agency recommendations, and what percent are done due to a conditional permit?

7. Are there inconsistencies in Federal and State programs? If so, in what areas?
   for example:
   ___type of mitigation measures suggested
   ___extent of mitigation required
   ___definition of wetlands
   ___jurisdiction
   ___other

8. Have recent attempts to improve the Federal-State permitting process been successful? If so, what specific changes have helped?
   for example:
   ___joint permitting
   ___general permits
   ___other

9. What other changes or improvements would you suggest?

10. How do you feel about the proposed general permit for converting some coastal land to agricultural use?

11. Section 404 of the Clean Water Act is of particular concern to our study due to the probable review of this act in next year's legislature. How has this section of the Clean Water Act, in its present form, affected your business?

12. How would proposed regulatory reforms to 404 affect your business? (The reforms would accomplish the following: reduce uncertainty and delay, give states more authority and responsibility, decrease conflict and overlap of policies, expand the use of general permits, and change jurisdictional control of 404).

13. Do you think the State should assume full 404 permitting responsibilities, or, is the current arrangement satisfactory? What level of government do you feel should assume the primary responsibility for regulating wetland use?

14. Do you feel that efforts to regulate your use of wetlands have had a net positive or a negative effect on the long-term success of your operation?